MINERALOGICAL ABSTRACTS

Notices of Books.

KLÜBER (Harald von). *Das Vorkommen der chemischen Elemente im Kosmos.* Leipzig (J. A. Barth), 1931, vii + 170 pp., 2 pls., 11 text-figs. Price 18 Mk.

This is a useful compilation of all the available knowledge respecting the occurrence of the chemical elements in the cosmos. The earth is, of course, taken as a basis for comparison, and a companion volume dealing with the earth by another author is promised. The author of the present volume is at the Astrophysical Observatory of Potsdam. The first section (pp. 1–33) gives a good outline of meteorites, which afford the only tangible material that can be submitted to direct methods. From a consideration of the hyperbolic paths of meteors it is concluded that some at least must come from interstellar space. The list of 31 elements previously known in meteorites has been increased to 78 by the recent work of I. and W. Noddack (1930). The moon can be examined only by its reflected light, the intensity of the reflection (albedo) and polarization being compared with that from volcanic rocks. Neither is any definite information given by the reflected light from the planets. The spectra of comets show the lines of hydrocarbons and cyanogen. More definite results are given by the spectroscopic analysis of the light emitted by the sun and the fixed stars ; in the sun 57 elements have been detected. Table 27 (p. 108) compares the relative abundance of elements in the sun's atmosphere, the earth's crust, and in stony meteorites. A bibliography of 292 items is added.

L. J. S.

BERG (Georg). *Vorkommen und Geochemie der mineralischen Rohstoffe. Einführung in die Geochemie und Lagerstättenlehre besonders für Chemiker und Studierende der allgemeinen Naturwissenschaften.* Leipzig (Akademische Verlagsgesellschaft), 1929, x + 414 pp., 57 figs. Price 26 Mk.

This book treats of ore-deposits from the point of view of geochemistry rather than from their economic importance. The general

D

part deals with the distribution of the chemical elements in the earth's crust and interior [M.A. 2–159, 558], and their concentration in certain parts of the crust. The second part gives a detailed account of the occurrence and distribution of each element.

                                                                L. J. S.

SCHNEIDERHÖHN (Hans) & RAMDOHR (Paul). *Lehrbuch der Erzmikroskopie.* Berlin (Borntraeger), 1931, vol. 2, xii + 714 pp., 1 col. pl., 242 text-figs. Price 72 Mk.

This exhaustive treatise on ore-microscopy, or the microscopical characters of the ore-minerals, is an extension or second edition of the earlier work by H. Schneiderhöhn [M.A. 4–340]. The first volume, or general part, is not yet published, and determinative tables are also to follow. The present volume, or special part, gives a systematic description of the various species grouped under elements, simple sulphides, sulpho-salts, strongly reflecting oxides and oxidized ores, and finally the gangue minerals and oxidized ores with little absorptive power. Under each species information is given of : I, the chemical composition, crystalline form, lattice structure and cell size, physical characters; II, characters developed by the process of polishing; III, reflective power, colour, anisotropic effects; IV, etching reactions; V, internal characters of individual crystals, twinning, &c.; VI, structure and texture; VII, diagnosis and difference from similar minerals; VIII, occurrence and paragenesis with statement of localities; IX, references to the literature. It is recommended that this order should be followed in all future descriptions of the ore-minerals. The authors have examined numerous (6,000) polished sections of ores from all parts of the world and many of the observations are now published for the first time. They themselves remark that possibly some errors have been made, but it must be remembered that this is largely pioneer work. Numerous photomicrographs are excellently reproduced in the text and they show some really wonderful structures and intergrowths. The book is well printed and it makes a handsome volume, which will long remain a standard work on the subject. We are pleased to find that the unnecessary terms ' chalcography ' and ' mineragraphy ' for this subject are now not even mentioned. The name chalcography was in use as long ago as 1661 for the art of engraving on copper.

                                                                L. J. S.

FARNHAM (C. Mason). *Determination of the opaque minerals.* New
York & London (McGraw-Hill Book Co.), 1931, vii + 236 pp.
Price 17s. 6d.

This book, although described on the title-page as a 'first edition ',
may be regarded as a second edition of W. M. Davy and C. M. Farn-
ham's 'Microscopic examination of the ore minerals ', 1920 [M.A.
1–198]. An outline is given of the technique of polishing sections of
opaque minerals and of their examination in reflected light (including
polarized light) under the metallographic microscope. This is
followed by a detailed description of the reactions to standard re-
agents and the characters of 216 minerals, including also some
important ore-minerals that are not opaque, arranged alphabetically.
A list is appended of 94 opaque minerals that have been proved to be
mixtures or are doubtful. Then follow determinative tables based
on the difference of behaviour with the standard reagents (HNO_3,
KCN, HCl, $FeCl_3$, KOH, $HgCl_2$), giving 65 divisions. In a series of
supplementary tables minerals are grouped according to colour,
streak, internal reflections, hardness, specific gravity, electrical con-
ductivity, reflectivity, and contained chemical elements. Tables of
microchemical and blowpipe tests and a bibliography are also given.
The information given in the book will be found useful, but it is not
free from errors. The 'Mineralogical Magazine ' is invariably quoted
as 'Mining Mag.'. L. J. S.

REINHARD (M.). *Universal Drehtischmethoden. Einführung in die
kristalloptischen Grundbegriffe und die Plagioklasbestimmung.*
Basel (B. Wepf & Cie.), 1931, 119 pp., 5 pls., 49 text-figs.
Price 10 Schw. Fr. = 8s. 6d. (bound 10s.).

The author has been impressed by the value of the universal
stage, not merely for the accurate determination of the optical con-
stants of plagioclase felspars and some other minerals, but as a
valuable method of teaching the optical properties of crystals.
Commencing with isotropic and uniaxial examples the student is led
on to the study of biaxial crystals of decreasing symmetry (rhombic,
monoclinic, triclinic) and then to the more difficult problems of the
triclinic felspars. Such a method can be followed by all who have
an elementary knowledge of crystal-optics and stereographic projec-
tions. To give a clearer idea of the method the author has devised
an enlarged model of the universal stage, into which can be fitted

models of the rotation ellipsoids of positive and negative uniaxial crystals, and of a triaxial ellipsoid. These, together with a set of eight models for demonstrating plagioclase twins, can be obtained from the publishers of the book at a price of 175 Swiss francs. The first part of the book is devoted to the principles of the method and experimental details ; the second to the determination of the plagioclase felspars. Workers with the universal stage will find many useful practical hints, and by following them they may avoid many errors. Five folding plates give stereograms used in the evaluation of the measurements of the plagioclase felspars. These can also be obtained from the publishers printed on cardboard. A critical review of data on which these curves are based shows the need for exact, up-to-date chemical analyses and optical measurements of the analysed material. At present, determinations accurate to within less than 5 % anorthite cannot be expected. A comparison with other methods shows the Fedorov method to be superior to all others and well worth the extra time spent on measurements with the universal stage.   W. C. S.

WASHINGTON (Henry S.). *The chemical analysis of rocks.* 4th edition, New York (J. Wiley & Sons) & London (Chapman & Hall), 1930, x⌄i + 296 pp., 1 pl.   Price $4.00 = 20s.

The fourth edition of this standard treatise is a very welcome addition to the analyst's bookshelf. The high standard of the previous editions [Min. Mag. **14**–115 and M.A. **1**–3] is maintained, while the incorporation of a number of new methods has enlarged the volume by 25 pages. Among the innovations, the gravimetric cupferron method for titania, the 8-hydroxyquinoline method for magnesia, and the introduction of methods for the long-desired determination of beryllia may be particularly mentioned. Soda-asbestos is an alternative to soda-lime, while magnesium and barium perchlorates are said to be better desiccants than calcium chloride. The high price of platinum is reflected in the discussion of platinum substitutes ; ' palau ' is said, indeed, to be preferable for the sodium carbonate fusion, while a silica-glass crucible may be used for the pyrosulphate fusion. The perchlorate method for potash is rejected on the ground of danger of explosion [but there is no danger of explosion whatever, unless the manipulation is radically wrong].   M. H. H.

KRAUS (Edward Henry) & HUNT (Walter Fred). *Tables for the determination of minerals by means of their physical properties, occurrences, and associates.* Second edition, New York & London (McGraw-Hill Book Co.), 1930, ix + 266 pp., 2 figs. Price 15s.

This second edition shows an increase of 12 pages on the first edition of 1911 [Min. Mag. **16**–166], but being printed on thicker paper it makes a rather thicker volume at almost double the price. The introductory chapter on the physical characters of minerals has been slightly extended, and there is a new table of minerals arranged in order of specific gravity (0·9–22·1). In the main part of the work there have been only minor alterations. According to the readily observed characters of lustre, colour, streak, and hardness, 41 pigeon-holes are provided for 250 common minerals; but the same mineral may get into as many as ten of these pigeon-holes, showing that the tables are not based on essential characters.   L. J. S.

VOSKUIL (Walter H.). *Minerals in modern industry.* New York (J. Wiley & Sons) & London (Chapman & Hall), 1930, ix + 350 pp., 9 figs. Price 18s. 6d.

The author of this book is a Professor of Industry, and he gives a readable account of the economic relations of minerals to modern industry. The ' machine age ' of the past hundred years has been responsible for the increasingly larger use of coal and iron-ore. In 1810 the consumption of pig-iron was 15 lb. and in 1900 350 lb. per person. The occurrence of these two materials on the seaboards of the North Atlantic has given rise to centres of industry in these areas. Other mineral products, especially copper for the electrical industry, flow to these areas. In a series of chapters on coal, oil, iron, alloying metals of steel, copper, bauxite and aluminium, lead and zinc, minor industrial minerals, mineral fertilizers, sulphur, and cement, discussions are given of the amounts available under present conditions and methods of working, their transportation, world's markets, international relations, &c.   L. J. S.

RIES (H.). *Elementary economic geology.* New York (J. Wiley & Sons) & London (Chapman & Hall), 1930, vii + 360 pp., 1 pl. (map), 187 text-figs. Price 18s. 6d.

This book is an abridgement of the author's well-known ' Economic geology ' of which a sixth edition appeared in 1930 [M.A. **4**–243], and it is intended as a one-term course for students. By cutting

down and especially by omitting descriptions of all but the more important localities a large amount of condensed information is given in 360 pages instead of 860 pages. To take in all the details would be rather a tax on a one-term student, and the large number of references given to the literature would involve several terms' reading. The book is very well printed and illustrated. The many excellent figures are numbered in a curious manner: when they occupy a whole page either singly or in pairs they form a numbered 'plate', which also bears a page-number, while other figures of the same character which do not fill or quite fill a page are numbered separately. Being a text-book compilation the volume is not entirely free from minor errors.   L. J. S.

TARR (W. A.). *Introductory economic geology.* New York & London (McGraw-Hill Book Co.), 1930, ix + 664 pp., 248 figs.

This adds one more to the now large selection of books on 'economic geology'. These deal rather with ore-deposits and deposits of other useful minerals, and do not touch on the applications of geology to questions of water supply, engineering work, &c. The author uses the alternative term 'applied mineralogy', and he speaks of the materials as 'earth materials'. After a general introduction on history and origins, Part II deals with metallic earth materials, and Part III with non-metallic earth materials. The latter are dealt with in groups: coal, oil and gas, structural materials, materials used chemically, materials of miscellaneous uses. Under each material a good account is given of its mineralogy, origin, occurrences, uses, methods of mining and treatment, production, &c. The subject-matter is concisely stated and clearly set out with side-headings; and is well illustrated with views, diagrams, graphs, and maps.   L. J. S.

RIES (H.) & WATSON (Thomas L.). *Elements of engineering geology.* Second edition, New York (J. Wiley & Sons) & London (Chapman & Hall), 1930, vii + 411 pp., 276 figs.

A somewhat enlarged edition of the first, published in 1921 [M.A. **1**–181]. The chapters of most interest to mineralogists are those on 'Rocks and their relations to engineering work', 'Road foundations and road materials', and 'Ore deposits'. The chapter on road materials contains brief descriptions of tests applied, and a table of the results given by twenty common rocks. There are some interesting points in paragraphs describing the uses of various rocks.

The work is well illustrated, but a few of the maps are difficult to read and would be better enlarged. W. C. S.

Mathematical Crystallography.

GOLDSCHMIDT (Victor). *Zur kristallographischen Systematik.* Centr. Min., Abt. A, 1930, pp. 177–190, 6 figs.
—— *On crystallographic classification.* Amer. Min., 1931, vol. 16, pp. 18–33, 6 figs. (Translated by M. A. PEACOCK.)

A defence of the author's system of crystallography as based on the gnomonic projection. Stress is laid on the morphology of crystals, the 'form-systems', including also a study of the structures of growth and solution. The grouping of crystals into six (not seven) systems is more natural than into thirty-two classes ; and the systems are simply defined by the number of variable elements (cubic 0, hexagonal and tetragonal 1, rhombic 2, monoclinic 3, triclinic 5). Röntgenography will eventually find its place as a branch of crystallography and be correlated with morphology. L. J. S.

GOLDSCHMIDT (Viktor). *Autonome und singuläre Knoten.* Centr. Min., Abt. A, 1930, pp. 209–219, 13 figs.
GOLDSCHMIDT (Victor). *Autonomous and singular nodes.* Amer. Min., 1931, vol. 16, pp. 78–89, 13 figs. (Translated by M. A. PEACOCK.)

' Nodes ' are the poles of crystal-faces on the gnomonic projection. The 'principal nodes' by their distribution give the 'gnomonic fields' (holohedral, hemimorphic, hemihedral, or tetartohedral) and determine the crystal-system and the elements. 'Primary nodes' determine the habit of the crystal, and 'autonomous nodes' are those which may be active in this direction (e.g. an octahedral or cubic habit in alum). 'Singular nodes' refer to largely developed faces with high indices, e.g. ($\bar{3}$.5.29) in calaverite, and (796) in wolfsbergite. Autonomous and singular nodes are related to the structure of the crystal particles. L. J. S.

GEBHARDT (Tim) & GOLDSCHMIDT (Victor). *Bestimmung der triklinen Linear-Elemente aus der gnomonischen Projektion.* Centr. Min., 1930, Abt. A, pp. 1–4, 4 figs.

Another solution for determining the linear constants of a triclinic crystal from the gnomonic projection [M.A. 4–299]. L. J. S.

LEONHARDT (J.). *Anwendung der Zylinderprojektion bei der Lösung kristallographischer Aufgaben.* Zeits. Krist., 1930, vol. 76, pp. 252–260, 1 pl., 5 text-figs.

For certain crystallographic purposes is recommended the use of the projection from the centre of a sphere on to the surface of a circumscribed right circular cylinder [apparently identified by an error with Mercator's conformal mapping of the sphere]. A 'net' is described for drawing such projections similar to the well-known stereographic, gnomonic, and orthographic nets. The use of the projection is illustrated by its application to etched lines on a crystal of wolframite.   H. H.

WHERRY (Edgar T.). *Suggestions as to standardizing the names of crystal forms.* Amer. Min., 1930, vol. 15, pp. 418–427.

A system of names is devised for the several simple forms in each of the 32 crystal classes, which suggest the number and arrangement of the faces rather than the shapes of the faces in the ideally developed simple crystal. For example, 'dihexahedron' for pentagonal-dodecahedron, 'chordo-ditrihedron' for rhombohedron of the first order, 'gyro-trigonaldipyramid' for trigonal-trapezohedron. Triakis-octahedron is contracted to 'trioctahedron'. Single faces in the asymmetric class of the triclinic system become 'brachydomo-monohedron', 'pyramidomonohedron', 'prismatimonohedron', &c.
                                                                    L. J. S.

LAVES (F.). *Ebenenteilung in Wirkungsbereiche.* Zeits. Krist., 1930, vol. 76, pp. 277–284, 10 figs.

Diagrams are given to show methods of dividing a plane into congruent or enantiomorphous polygons each having 3, 4, 5, or 6 sides and being equivalent under the movements of a space-group of the crystal class C_{2v}.   H. H.

MOTZOK (D.). *Mehrdimensionale Symmetrie und Substitutionstheorie.* Zeits. Krist., 1930, vol. 75, pp. 345–362, 4 figs.

The author stresses the connexion between permutation-groups and groups of movements in space of any number of dimensions.
                                                                    H. H.

ITO (Teiichi). *Radienquotient der Partikelgruppen und Koordinationszahl.* Zeits. Krist., 1930, vol. 73, pp. 365–375, 7 figs.

The conception of isogonal particle groups [M.A. 4–299] is developed as a geometrical generalization of A. Werner's co-ordination

theory. The number of A particles forming the isogonal particle group, in contact with each other and with the central particle B, is the co-ordination number of B. The tables and graphs of the author's previous work are extended for the various types of co-ordination to those symmetry-classes where the fundamental isogonal polyhedral angle θ can vary. θ and the related Goldschmidt's angles ϕ and ρ are tabulated and graphed with the corresponding radii ratios R_A/R_B. F. A. B.

NIGGLI (P.) & LAVES (F.). *Homogene systemssymmorphe Baunetze und Baugitter.* Zeits. Krist., 1930, vol. 73, pp. 381–427, 21 figs.

' Systems-symmorphous ' lattices are defined as homogeneous lattices, the centres of mass of their particles being arranged according to the symmetry of a translation-group. A similar definition applies to a net. The various nets and lattices corresponding to simple and complex types of co-ordination are described and figured. Tables relate these possibilities to space-group theory and graphs are plotted showing the relationship between the ' space-filling numbers ' and the axial ratios. Only a limited number of the structures thus deduced are represented by crystalline bodies. The selection principle is probably to be referred to the forces of repulsion and attraction. F. A. B.

BECKENKAMP (J.) [1855–1931]. *Grundzüge einer dynamischen Kristalltheorie.* Erster Teil. Verhandl. Phys.-Med. Gesell. Würzburg, 1930, vol. 55, pp. 1–30, 17 figs.
—— *Grundzüge einer dynamischen Kristallographie.* Zweiter Teil. Würzburg (privately printed), 1930, 29 pp., 1 fig. And later sheet of corrections and additions to the two parts.

By considerations of symmetry and assumptions, for details of which the original paper must be consulted, the author deduces a structure for quartz in agreement with that obtained by X-ray methods. He then deduces the four separate methods of filling space with tetrahedra, and surveys a large number of known crystal-structures which can be relegated to any one of these tetrahedral formations. The second paper chiefly consists of a discussion of the theory of ferromagnetism. The author also figures a model of the benzene molecule and concludes his work characteristically with quotations ranging from Kant to Einstein. F. A. B.

PARKER (Robert L.). *Eine neue Methode des Kristallzeichens.* Schweiz. Min. Petr. Mitt., 1928, vol. 8, pp. 448–449 ; Actes Soc. Helv. Sci. Nat., 1928, Session 109, pp. 179–181.

—— *Über die graphische Ermittlung der Bildkantenazimute beim parallelprojektiven Kristallzeichen.* Schweiz. Min. Petr. Mitt., 1929, vol. 9, pp. 456–461, 4 figs.

The first paper describes the author's new method of crystal-drawing developed more fully in his book ' Kristallzeichen ' [M.A. 4–147]. In this work he shows how to calculate the ' Bildkanten-azimute ' ϕ. The second paper develops a graphical method of obtaining not only the necessary azimuth angles ϕ for each zone-axis but also the foreshortening factor $\cos \alpha$. He derives from a stereographic projection of the crystal a projection in which the pole of the face on which the crystal is to be projected falls upon the south pole of the primitive ; the values of ϕ and α are then given directly by the great and small circles of the net respectively. The graphical method is more suitable for triclinic crystals, complex twins, and cut gems. F. A. B.

PARKER (R. L.). *Die Kristallmorphologie im Lichte neuerer analytischer Untersuchungen.* Fortschritte Min. Krist. Petr., 1930, vol. 14, pp. 75–142, 8 figs.

An analysis is made of available observations on the habit, number of forms, predominance of zones, &c., of many common minerals and the relation of these external phenomena to the internal constitution of the crystals. H. H.

CHUDOBA (Karl). *Zur morphologischen Typisierung der verschiedenen Kristalltrachten.* Centr. Min., Abt. A, 1930, pp. 334–338, 2 figs.

Isometric, planar, and axial habits of crystals may be distinguished by the signs I, P, and A respectively. By the addition of indices, e.g. I_{100} indicates a cubic habit, P_{001}^a a crystal tabular parallel to the base with elongation along the a-axis, and A_c prismatic habit in the direction of the c-axis. L. J. S.

Crystal-optics.

GAUDEFROY (C.). *Sur la dispersion de biréfringence dans les cristaux.* Bull. Soc. Franç. Min., 1924, vol. 47, pp. 179–352, 4 pls., 19 text-figs.

A complete theoretical study of the subject. Two long chapters are devoted to the dispersion phenomena of crystalline wedges in

monochromatic and white light. The author also discusses the variations of dispersion of birefringence in the same crystal and concludes with applications of this study to the determination of minerals.

F. A. B.

ALOISI (P.). *Deduzione semplificata della formula di Fresnel in due casi particolari.* Periodico Min. Roma, 1931, vol. 2, pp. 1–4, 1 fig.

A simple deduction of the formulae giving the intensity of the light produced by interference with a crystal plate between crossed or parallel nicols.

L. J. S.

WRIGHT (F. E.). *A spherical projection chart for use in the study of elliptically polarized light.* Journ. Optical Soc. Amer., 1930, vol. 20, pp. 529–564, 19 figs.

The nature of the elliptically polarized light emerging from a crystalline plate when the incident light is plane-polarized is considered; also the light emerging from two such plates superposed, as, for instance, when any crystal section is placed under a quarter-wave plate. The solution of the problem is largely graphical, use being made of a projection-net, which consists of two superposed stereographic nets at right angles to each other.

H. H.

MOUNTAIN (E. D.). *The use of ray-surfaces in interpreting optic pictures given by crystals in convergent polarized light.* South African Journ. Sci., 1929, vol. 26, pp. 70–79, 12 figs.

Sections of uniaxial crystals parallel to the optic axis and of biaxial crystals parallel to the optic axial plane give the same type of interference-figure in convergent polarized light. The number of bands is a measure of the optic axial angle: when $2V$ is 90° there are no bands. These conditions are discussed geometrically, and it is shown how the optic sign of the crystal can be determined. Interference-figures of this type are shown in crushed fragments of minerals that possess a good cleavage parallel to the optic axial plane, e.g. diaspore, euclase, fibrolite, gypsum, stilbite, and zoisite.

L. J. S.

GAUDEFROY (C.). *Demi-onde et quart d'onde achromatiques par superposition de plusieurs lames cristallines.* Bull. Soc. Franç. Min., 1929, vol. 52, pp. 147–160, 2 figs.

The retardation of two superposed plates of opposite sign is approximately a linear function of the wave-length for those wave-

lengths near to and greater than the wave-length corresponding to
zero retardation. The author deduces the theoretical condition for
these achromatic combinations and thence calculates the required
thicknesses of quartz and calcite to give a half-wave plate achromatic
in the neighbourhood of $\lambda = 5893$ Å.   F. A. B.

ORCEL (J.). *La mesure du pouvoir réflecteur des minéraux opaques
à l'aide de la cellule photo-électrique, et ses applications.* Bull.
Soc. Franç. Min., 1930, vol. 53, pp. 301–349, 6 pls., 13 text-figs.
[M.A. **3**–400, **4**–229.]

The theory of the reflection of light by opaque bodies is re-
capitulated following F. E. Wright [M.A. **1**–198]. A method for
measuring the reflecting powers of a mineral section using a photo-
electric cell is described. A series of standard scales is chosen
comprising diamond, blende, galena, platinum, and silver. The ratios
of their calculated reflecting powers agree well with the experimental
ratios for white light. The reflecting power of diamond for different
wave-lengths is then calculated and the corresponding values obtained
on a cube-face of pyrite by direct comparison. The dispersion curves
for the remaining scales are, however, calculated. The reflecting
power of a mineral section for any wave-length can then be compared
directly with the reflecting power of the nearest standard scale. The
wave-length chosen for general work is about 4650 Å., at which the
photo-electric cell is most sensitive. The author applies the method
to measuring absolute reflecting powers of minerals in air and in
liquids of known refractive index, the angle of rotation of the plane of
polarization of the incident light, optical sign, approximate refractive
indices, absorption coefficients and dispersion of reflecting power.
These quantitative methods do not, however, eliminate chemical tests
for determination in certain cases. The author gives a series of
measurements on a number of minerals sufficient to determine the
reflection ellipsoid and which will also form a basis for determinative
work on opaque minerals.   F. A. B.

SCHLOßMACHER (K.). *Die Absorption mangan- und chromgefärbter
synthetischer Spinelle.* Zeits. Krist., 1930, vol. 75, pp. 399–409,
2 figs.

The absorption of light for the range of wave-length 400–600 $\mu\mu$
caused by artificial spinels of the composition $MgO.Al_2O_3$, coloured
red by traces of Cr_2O_3 and Mn_2O_3, was measured.   H. H.

SCHAEFER (Clemens) & BORMUTH (Carl). *Über die kurzwellige ultrarote Absorption künstlichen und natürlichen Sylvins.* Zeits. Physik, 1928, vol. 50, pp. 363–365, 1 fig.

Artificial sylvine does not exhibit the absorption bands at 3230 and 7230 Å. shown by the natural mineral. The authors refer these bands to the presence of ammonium in natural sylvine.   F. A. B.

PARSONS (A. L.). *Iridescent color in peristerite.* Amer. Min., 1930, vol. 15, pp. 85–97, 3 figs.

A review is given of the literature on the iridescent colours of labradorite, and an analogy is drawn between interference by reflection with light and X-rays. Peristerite from pegmatite in the felspar quarry at Hybla, Monteagle township, Hastings Co., Ontario, shows in some specimens a central iridescent portion (anal. I by M. C. Haller) with a non-iridescent border (anal. II); in both albite amounts to 82·27 %, with less orthoclase and anorthite in II. The diffuse reflection is from an internal plane, with approximate indices $(\bar{1}.15.\bar{3})$, at 23° 15′ from (010). The iridescence is thought to be due to interference by reflection at twin-lamellae.

	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	Na_2O.	K_2O.	H_2O.	Total.	Sp. gr.
I.	66·25	20·94	0·34	1·23	9·74	1·50	0·20	100·20	2·631
II.	66·72	20·98	0·31	0·81	9·74	1·12	0·16	99·84	2·628

L. J. S.

EHRINGHAUS (A.). *Interferenzfarben bei Kombination und Mischung von doppelbrechenden und optisch-drehenden Kristallen.* Zeits. Krist., 1930, vol. 75, pp. 179–195, 1 fig.

The preparation of a crystal plate with given dispersion of the double refraction is much restricted by the difficulty of obtaining easily worked crystals of sufficient size. But a far wider range of possibility is obtained by superposing two crystalline plates of different material. The author works out formulae for this case, with applications to various media such as quartz, calcite, &c., and deals also with the properties of similar composite crystalline wedges. He then considers the dispersion of the doubly refracting plates formed of mixed crystals, and discusses also the dispersion of rotation of the polarization-plane for composite plates or mixed crystals formed of optically active media.   H. H.

LOWRY (T. M.) & SNOW (C. P.). *The optical rotatory power of quartz on either side of an infra-red absorption band.* Proc. Roy. Soc. London, Ser. A., 1930, vol. 127, pp. 271–278.

Further measurements [M.A. 4–56] are given for wave-lengths 18000 to 28000 and 31800 to 32100 Å. The rotations per mm. at 20° C. range from 2·061° to 0·520°.   L. J. S.

FABER (W.). *Weitere Beobachtungen an Adrenalonchlorhydrat: Inkonstanz der Brechungsexponenten.* Zeits. Krist., 1930, vol. 75, pp. 147–152, 1 fig.

Different crystals of adrenalone hydrochloride give slightly different values of the refractive indices, the discrepancies being especially noticeable in the monoclinic modification. The differences cannot be due to errors of measurement, change of temperature, or alteration with age, and are probably to be ascribed to imperfect internal structure.   H. H.

PORTER (Mary W.). *The refractive indices of mixed crystals of magnesium sulphate and zinc sulphate.* Zeits. Krist., 1930, vol. 75, pp. 288–300, 2 figs.

The authoress wished to determine whether the refractive indices of a series of mixed crystals are connected with their composition by a linear relation. Such a series must consist of mixed crystals perfectly homogeneous, capable of easy chemical analysis, and possessing plane polished faces of sufficient size for use with the Abbe refractometer. Moreover, the difference between corresponding refractive indices of the two end-members of the series must be sufficiently large. The series Am_2SO_4–Rb_2SO_4, $MgSO_4.7H_2O$–$NiSO_4.7H_2O$, and some pairs chosen from the K, Rb, Am, Cs, Tl ditartrates proved unsuitable for some reason or another; but the series $MgSO_4.7H_2O$–$ZnSO_4.7H_2O$ was found to be manageable, and gave straight-line graphs when the principal refractive indices were plotted against molecular volume, or weight-percentage.   H. H.

BERGER (W.), RINNE (Friedr.), & RÖSCH (S.). *Photographische Darlegung thermooptischer Verhältnisse des Gipses als Beitrag zur kristallographischen Kenntnis des Gipsbrennens.* Ber. Math.-Phys. Kl. Sächs. Akad. Wiss. Leipzig, 1929, vol. 81, pp. 171–198, 6 pls., 9 text-figs.

After discussing the work done by other writers [Min. Mag. **16**–257] on the variation of the position of the optic axes of gypsum with change of temperature, the authors describe their own apparatus for

obtaining photographic records of the phenomenon. In addition to a quantity of numerical data they give thirty-six such pictures of the figures seen in convergent light through the polarization-microscope for wave-lengths 746, 589, 532, 423 $\mu\mu$ and temperatures varying from 30° to 115° C.   H. H.

SCHWIETRING (Fr.). *Die Methode der Totalreflexion für eine beliebig orientierte Kristallfläche. I. Teil.* Zeits. Krist., 1930, vol. 75, pp. 449–501, 16 figs. *II. Teil.* Ibid., 1930, vol. 76, pp. 87–132, 11 figs.

This work consists of : (*a*) an exhaustive theoretical and practical study of the polarization phenomena which accompany total reflection at a crystal face ; (*b*) the development of a method for determining all three principal refractive indices from any section of a biaxial substance ; (*c*) the application of this method for determining the refractive indices of a series of minerals. A particular point of interest is the fundamental difference in the polarization phenomena for grazing incidence and total reflection. The latter method is to be preferred for accurate work and an estimation of the various errors involved is fully considered. The refractive indices are calculated correct to about ± 0.0002 for various minerals. The most important adjustment is that for the eccentricity of the glass hemisphere, and the refractive index of the hemisphere is the basis for every measurement of limiting angle.   F. A. B.

FABER (W.). *Über eine Abänderung der Brögger-Ramsayschen Methode zur Messung der Brechungsexponenten von Kristallen an Prismen aus natürlichen Kristallflächen.* Zeits. Krist., 1930, vol. 75, pp. 332–336, 1 fig.

Natural crystal prisms have sometimes been used to determine the principal refractive indices of the substance, using either the position of minimum deviation or that in which light is incident normally on the first face of the prism. The latter case is impossible, unless the angle of the prism is small, owing to total reflection at the second face of the prism. The difficulty may be overcome by immersing the crystal in a medium such as water or monochlorbenzol. H. H.

VOELLMY (Hans). *Über die Dispersion ultravioletter Strahlen durch flüssige organische Substanzen.* Zeits. Physikal. Chem., 1927, vol. 127, pp. 305–357, 34 figs.

An ingenious apparatus for measuring refractive indices of liquids between wave-lengths 2150 and 6560 Å. is described. Light from

a spark-source is focused upon a horizontal slit by a quartz lens and a parallel beam from a parabolic mirror suitably placed passes through a quartz refractometer designed by V. Henri. The refracted beam is focused by a second parabolic mirror upon the slit of a quartz spectrograph. The Henri refractometer is made up of a quartz prism, the vertical face perpendicular to the beam having a cylindrical cut into which fits a half-cylinder of quartz. The latter can be rotated and the angle between its plane face and the vertical face of the prism can be read correct to 1 minute. Three vertical quartz plates are cemented to this prism so that a prism trough to hold the liquid is formed with its refracting edge horizontal and parallel to the optic axis of the quartz. Into this trough when empty a second quartz prism fits accurately and when the half-cylinder is so oriented that its plane face and the first prism face are coincident an undeviated spectrum is focused upon the spectrograph slit. From the angle through which the half-cylinder has to be turned in order to bring the deviated spectra obtained when the trough is filled with a liquid to the undeviated position the refractive index of the liquid can be determined. The original paper should be consulted for the details of the photographic method employed.   F. A. B.

LOWRY (T. M.) & ALLSOPP (C. B.). *A photographic method of measuring refractive indices*. Proc. Roy. Soc. London, Ser. A, 1929, vol. 126, pp. 165–169, 2 figs.

An elegant interference method of measuring the refractive indices of liquids over a wide range of wave-lengths and particularly for the ultra-violet region has been developed. A thin wedge or parallel-sided film of liquid is held between two quartz plates and the interference fringes formed by parallel monochromatic light focused upon the slit of a spectrograph. The method is applied to nicotine; the measurements of refractive index can be carried out down to 2900 Å. that is, to within 250 Å. of the maximum of a strong absorption band.
                                                         F. A. B.

GEFFCKEN (W.) & KOHNER (H.). *Über einige Verbesserungen der Methodik von Refraktionsmessungen an Lösungen*. Zeits. Physikal. Chem., Abt. B, 1928, vol. 1, pp. 456–465, 7 figs.

For the purpose of accurate measurements on the refractive indices of solutions of various salts of known concentration, the authors employ an improved type of Pulfrich refractometer. The graduated circle is accurately divided into $\frac{1}{2}$ degrees and is provided with a

vernier; also the observation microscope has a double cross-wire. The yellow line $\lambda = 5870$ Å. from a helium tube is used instead of sodium-light, since it gives a stronger limiting line, the position of which can now be measured correctly to $\pm \frac{1}{20}$ minute. The maximum error of the modified instrument with helium-light for this type of work is estimated as ± 0.00002. F. A. B.

BARTH (Tom.) & BERMAN (Harry). *Neue optische Daten wenig bekannter Minerale.* (*Die Einbettungsmethode*). Chemie der Erde, 1930, vol. 5, pp. 22–42, 1 fig.

Mention is made of various immersion media of high refraction and of the dispersion method of determining refractive indices. Optical data supplementing E. S. Larsen's Tables (1921) are given for : Akrochroite, apatite, arduinite, britholite, cornetite, dihydrite, duftite, dussertite, ehlite, fergusonite, lorenzenite, lunnite, melanovanadite, minervite, monetite, narsarsukite, palmerite, paternoite, pseudomalachite, ramsayite, risörite, rosasite, sipylite, sursassite, svabite, tangeite, truscottite, uzbekite. L. J. S.

BORGSTRÖM (L. H.). *Ein Beitrag zur Entwicklung der Immersionmethode.* Compt. Rend. Soc. Géol. Finlande, no. 2, *in* : Bull. Comm. Géol. Finlande, 1929, no. 87, pp. 58–63, 3 figs.

Merwin's highly refractive (*n* up to 1·86) immersion liquids consisting of AsI_3, SbI_3, SnI_4 dissolved in methylene iodide have the disadvantage of being dark in colour. $AsBr_3$ dissolved in methylene iodide gives a clear pale-yellow liquid of refractive index up to 1·78 ; and by adding also AsS up to 1·92. The solution containing much AsS is, however, not stable. The refractive indices of these liquids for three wave-lengths (Li, Na, Tl) and at various temperatures are plotted on curves. L. J. S.

FISK (H. G.). *Preparation and purification of the tri-iodides of antimony and arsenic for use in immersion media of high refractive index.* Amer. Min., 1930, vol. 15, pp. 263–266.

SbI_3 and AsI_3 are prepared by heating together the elements and purified by crystallization from carbon disulphide. Mixed with piperine (purified by crystallization from alcohol) they give melts with refractive index 1·85–2·05. These melt at a little over 100° C. and commence to decompose at 135° C. L. J. S.

E

Physical Properties.

LANDES (Kenneth K.). *Rapid specific gravity determinations with Clerici's solution.* Amer. Min., 1930, vol. 15, pp. 159–162, 1 fig.

Clerici's solution (thallium formate and malonate in water, M.A. 2–487) of specific gravities ranging from 2·0 by 0·1 to 4·1 is contained in a series of 22 tubes (each 8 × 1 inches and containing 15 c.c. of liquid). The sp. gr. is previously determined with a Westphal balance, and there is little variation if the tubes are kept tightly corked. Mineral fragments to be tested are supported on a perforated spoon which is lowered into the tubes.   L. J. S.

LANDES (Kenneth K.). *A mineral specific gravity chart.* Amer. Min., 1930, vol. 15, pp. 534–535, 1 pl.

The chart (80 × 23 cm.) gives along one edge an alphabetical list of 540 minerals and along an edge at right angles specific gravities from 1·40 to 22·0 (with intervals of 0·02 for the range 2·0–4·0). Lines indicate the range in sp. gr. for each mineral. [Cf. Min. Mag. 21–361.]   L. J. S.

TAMMANN (G.) & JENCKEL (E.). *Über die Dichte von Kristallen nach ihrem Erkalten unter erhöhten Druck.* Zeits. Anorg. Chem., 1930, vol. 186, pp. 141–144, 1 fig.

Whereas the density of a glass is increased when it is allowed to solidify under high pressure, this excess density disappearing when it is reheated to a moderate temperature under normal pressure, no such effect can be observed with crystalline substances. The diminution of the density of felspars after heating, observed by Hayes (1861) and Mohr (1868), which would seem to indicate such an effect, is explained by partial fusion and solidification as a glass.

M. H. H.

BUERGER (M. J.). *Translation-gliding in crystals.* Amer. Min., 1930, vol. 15, pp. 45–64, 12 figs. [Cf. M.A. 4–64, 213.]

A general account is given of the plastic deformation of crystals by the mechanism of twin-gliding, translation-gliding (or pure translation), and twist-gliding. This is considered in some detail from the point of view of symmetry. Experimental methods and the interpretation of results are also described. A useful table sum-

marizes the results hitherto obtained with various substances, with references to the literature (largely due to O. Mügge [M.A. 1–245, &c.]).

<div align="right">L. J. S.</div>

BUERGER (M. J.). *Translation-gliding in crystals of the NaCl struc-tural type.* Amer. Min., 1930, vol. 15, pp. 174–187, 226–238, 10 figs.

A large number of new observations are recorded, and the relation between translation-gliding and crystal-structure is discussed in some detail. For NaF, NaCl, NaBr, NaI, KCl, KBr, KI one glide-plane T is (110) and the glide-direction t in this plane is $[1\bar{1}0]$; another is $T' = (001)$, $t' = [1\bar{1}0]$. For RbCl, β-NH$_4$I, and MgO $T = (110)$, $t = [1\bar{1}0]$. For PbS and PbTe, $T' = (001)$, $t' = [1\bar{1}0]$, and $T'' = (001)$, $t'' = [100]$. T is dependent on the ratio of the radii of the two kinds of ions and on their polarizabilities, while t is determined by densest rows of ions of the same kind.

<div align="right">L. J. S.</div>

TOKODY (L.). *Über die rhombendodekaedrische Translation von Stein-salz.* Zeits. Krist., 1930, vol. 73, pp. 116–119, 2 figs.

The apparent rhombic-dodecahedral cleavage which can be pro-duced in rock-salt at room-temperatures is often of a step-like appear-ance and is the resultant of two cubic cleavages.

<div align="right">F. A. B.</div>

WASSERMANN (G.). *Über die Zerreißfestigkeit und Spaltbarkeit von Wismut- und Antimonkristallen.* Zeits. Krist., 1930, vol. 75, pp. 369–378, 7 figs.

A study is made of the twin-lamellae produced by mechanical stresses in single crystals of bismuth and antimony prepared by heating the molten metals and slow cooling in vacuo. The twin-laws observed by O. Mügge (1886) are thereby confirmed. The critical breaking stress applied normal to the rhombohedral face $(01\bar{1}2)$ is shown to be about twice that for the face (0001) and slightly greater than 680 g./mm.^{2}, in agreement with previous observations. The breaking stress is measured for various angles of inclination to the face (0001) for both bismuth and antimony. It is found that these determinations afford a quantitative comparison of the cleavage on different faces of the same crystal. Antimony-bismuth melts yield crystals which possess an inhomogeneous den-dritic structure.

<div align="right">F. A. B.</div>

GOUGH (H. J.) & COX (H. L.). *The behaviour of a single crystal of antimony subjected to alternating torsional stresses.* Proc. Roy. Soc. London, Ser. A, 1930, vol. 127, pp. 431–453, 5 pls., 9 text-figs.

Crystals of aluminium, iron, and zinc glide along planes of the greatest atomic density and in the direction of the greatest (linear) atomic density. In antimony the lines of maximum density do not lie in the planes of greatest density, and with such a crystal it was hoped to determine the relative importance of these two factors. No slip-planes were, however, observed. Cracks were developed parallel to the basal plane, and the crystal finally broke along the rhombohedral twin-planes (110). L. J. S.

GOUGH (H. J.) & COX (H. L.). *The behaviour of a single crystal of zinc subjected to alternating torsional stresses.* Proc. Roy. Soc. London, Ser. A, 1929, vol. 123, pp. 143–167, 6 pls., 7 text-figs. —— —— *Further experiments on the behaviour of single crystals of zinc subjected to alternating torsional stresses.* Ibid., 1930, vol. 127, pp. 453–479, 4 pls., 10 text-figs.

The slip-plane in zinc is the basal plane (0001), and the direction of slip is one or other of the crystallographic axes a. This slip-plane with twinning on the hexagonal pyramid $(10\bar{1}2)$, $c\bar{c} = 94° 5'$, gives rise to what has been mistaken for a prismatic cleavage in zinc.

L. J. S.

BLANK (F.). *Über die Kohäsionsgrenzen des Steinsalzkristalls.* Zeits. Physik, 1930, vol. 61, pp. 727–749, 15 figs.

A cleavage block of rock-salt is stretched between supports and subjected to an increasing pulling force perpendicular to a cube-face till striations appear on the surface. These are due to the formation of the rhombic-dodecahedral glide-planes. The elastic limit S is defined as the force applied per unit area of the cross-section required to produce the first glide-striations. It varies for twelve specimens of rock-salt from different localities from 70 to 500 g./mm.², being always less than the breaking stress Z which varies from 217 to 1722 g./mm.². Crystals prepared from fusion give corresponding values for S and Z of 280 and 334 g./mm.². Artificial and natural crystals preheated at various temperatures for six hours show a decrease in S and Z as the preheating temperature is increased. A minimum occurs for all specimens at 600° C. Variations in the values for natural crystals are attributed to previous thermal history,

but more especially to small quantities of impurities. The lowest values of S and Z quoted above are considered to be typical of a pure natural rock-salt free from strain. F. A. B.

TERTSCHE (H.). *Einfache Kohäsionsversuche. I. Arbeitsmethode und Zugspaltungsversuche am Steinsalz.* Zeits. Krist., 1930, vol. 74, pp. 476–500, 6 figs.

An apparatus is described which was designed for accurate measurement of the cohesion of crystals submitted to tension, pressure, or impact. It was applied to determine the behaviour of rock-salt under such stresses. H. H.

MÜGGE (O.). *Einfache Schiebungen an einigen künstlichen Kristallen.* Zeits. Krist., 1930, vol. 75, pp. 32–40, 3 figs.

$Na_2Pt(CN)_4.3H_2O$, $KHCO_3$, and manganese formate $Mn(CO_2H)_2$. $2H_2O$ all admit a simple shear with plane of separation (001), which moves any face (hkl) into the position of $(hk\bar{l})$. H. H.

OBREIMOFF (J. W.). *The splitting strength of mica.* Proc. Royal Soc. London, Ser. A, 1930, vol. 127, pp. 290–297, 1 pl., 4 text-figs.

Two freshly split foils of mica if put together in optical contact adhere again with appreciable force. Measurements were made when sheets of muscovite were split with a glass wedge, and the surface energy is calculated as 1,500 ergs per sq. cm. in air and 20,000 in high vacuum. When mica is split in the dark a slight luminescence, due to electrical discharges, is seen; this is more brilliant under lower atmospheric pressure. L. J. S.

SCHUBNIKOW (A.) [= SHUBNIKOV (A.)]. *Über Schlagfiguren des Quarzes.* Zeits. Krist., 1930, vol. 74, pp. 103–104, 2 figs.

The feeble cleavage of quartz along ($10\bar{1}1$) may be made visible by striking with a steel point a face cut perpendicular to the axis, followed by suitable regrinding and etching of the face. H. H.

FREISE (Fred. W.). *Untersuchung von Mineralen auf Abnutzbarkeit bei Verfrachtung im Wasser.* Min. Petr. Mitt. (Tschermak), 1931, vol. 41, pp. 1–7.

Experiments on the wearing hardness of minerals found in the gold, diamond, and monazite sands of Brazil. Cut cubes of the minerals were placed with water in a rotating drum and the loss of weight determined [M.A. 4–254]. L. J. S.

Brück (Hermann). *Über die wellenmechanische Berechnung von Gitterkräften und die Bestimmung von Ionengrößen, Kompressibilitäten und Gitterenergien bei einfachen Salzen.* Zeits. Physik, 1928, vol. 51, pp. 707–727, 1 fig.

An application of quantum mechanics to the calculation of compressibilities of the halides of monatomic metals. Values in agreement with experimental observations are obtained. The calculated sizes of ions are, however, smaller than the values deduced by Pauling and Goldschmidt. [Cf. Min. Mag. **22**–70.]   F. A. B.

Kôzu (Shukusuké) & Takané (Katsutoshi). *Influence of temperature on the axial ratio, the interfacial angle and the volume of quartz.* Sci. Rep. Tôhoku Univ. Sendai, Japan, Ser. 3, 1929, vol. 3, pp. 239–246, 4 figs.

The linear coefficients of expansion of quartz parallel to the c and a axes have been previously measured [M.A. **3**–148]. Assuming the axial ratio of quartz at room-temperatures, the authors thence calculate the axial ratio at various temperatures up to 800° C. The interfacial angles $(10\bar{1}0):(10\bar{1}1)$ and $(10\bar{1}1):(\bar{1}101)$ are also deduced over this temperature range. Both sets of values agree with the measurements of Rinne (1911) and Wright (1913) (the interfacial angles up to 800° C.) and with the axial ratios thence computed. The volume expansion also calculated from the linear coefficients agrees with recent measurements. Assuming the density of quartz at 20° C. as 2·649, the densities up to 1050° C. are calculated.

F. A. B.

Kôzu (Shukusuké), Masuda (Miné-ichi), & Ueda (Jun-ichi). *Changes in axial ratio, in interfacial angle and in volume of calcite, caused by heating.* Sci. Rep. Tôhoku Univ., Sendai, Japan, Ser. 3, 1929, vol. 3, pp. 247–258, 4 figs.

Cylinders were cut from two crystals, one from Cumberland and the other from the Ashio mine, Shimotsuke province, Japan. The linear coefficients of expansion parallel to the a and c axes were measured by a differential method over a range of temperature 20°–900° C.; the results for the two crystals agree well. From experiments on the loss of weight of these crystals over this range of temperature, it is concluded that up to 700° C. the observations are not affected by dissociation. The authors thence calculate the change in axial ratio, interfacial angle $(10\bar{1}1):(\bar{1}101)$, and density

from 25°–700° C.   There is good agreement with Rinne's experimental values for the interfacial angles (1914).   F. A. B.

Kôzu (Shukusuké) & Ueda (Jun-ichi).   *Optical and thermal studies of topaz from Naegi, Japan.* Sci. Rep. Tôhoku Univ., Sendai, Japan, Ser. 3, 1929, vol. 3, pp. 161–170, 3 figs.

The indices of refraction of two topaz crystals of different habit were measured both for the inner and outer portions of the crystals ; $2E$ was measured for the inner portions of both crystals.   Hence the fluorine content is estimated as 18–19 %, in approximate agreement with a rough chemical analysis.   The linear coefficients of expansion parallel to the a, b, and c axes were measured over the temperature range 20°–1000° C.   Assuming the value of the axial ratio of topaz found by an X-ray method [M.A. 4–280], both the axial ratio and the interfacial angles $(110):(1\bar{1}0)$, $(011):(0\bar{1}1)$, and $(001):(011)$ are calculated for the same temperature range.   Experiments on the change of weight of topaz heated in air show that decomposition takes place from 1258°–1300° C.   F. A. B.

Gyulai (Z.) & Hartly (D.).   *Elektrische Leitfähigkeit verformter Steinsalzkristalle.* Zeits. Physik, 1928, vol 51, pp. 378–387, 5 figs.

When a unilateral stress is applied to rock-salt plates a sudden increase in electrical conductivity is observed which decreases rapidly at first and then gradually to a constant value if the stress be maintained.   On decreasing the stress no marked change in conductivity occurs, nor yet on reapplication of any stress less than the initial value.   The author also studies the discontinuous alterations in thickness of rock-salt plates with applied pressure and discusses the results obtained.   F. A. B.

Gingold (J.).   *Über die Elektrizitätsleitung im festen NaCl bei Zimmertemperatur.* Zeits. Physik, 1928, vol. 50, pp. 633–643, 4 figs.

Measurements of the electrical conductivity of natural rock-salt and the artificial salt prepared in various ways show that the conductivity increases with the number of distortions in the lattice and that a perfect crystal of rock-salt should possess infinite resistance.
        F. A. B.

JEŻEWSKI (Mieczysław). *Über den Einfluß des elektrostatischen Feldes auf die Dielektrizitätskonstante der Körper in nematischer Phase (flüssige Kristalle).* Zeits. Physik, 1928, vol. 51, pp. 159–164, 3 figs.

The dielectric constants of p-azoxyphenetol and p-azoxyanisol are measured by a resonance method with field strengths varying from 0 to 1000 volts per cm. In the amorphous phase no change of dielectric constant with field strength is observed, but in the nematic or liquid-crystal phase the dielectric constant decreases with increase in field strength and approaches a constant value at 1000 volts per cm. dependent on the temperature.　　　　　　　　　　　F. A. B.

HETTICH (A.) & SCHLEEDE (A.). *Beiträge zur Methodik der Kristallklassenbestimmung.* Zeits. Physik, 1928, vol. 50, pp. 249–265, 12 figs.

The authors discuss the high frequency resonance method of Giebe and Schiebe and Meissner's valve-electrometer method of determining piezo-electricity. The latter method is developed and a probe used for locating the charges developed in a crystal under strain. A series of diagrams are given for the 32 classes of symmetry showing the distribution of charges to be expected in each case.

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MARSHALL (C. E.). *The orientation of anisotropic particles in an electric field. Part I. General. Part II. Application to the determination of the double refraction of clays.* Trans. Faraday Soc. London, 1930, vol. 26, pp. 173–189, 1 fig.

The effect of steady and alternating electric fields and of cataphoretic motion in orienting isotropic particles in colloidal suspension is considered, and it is shown that the effect of alternating current will in general preponderate, and will cause the particles to orient themselves with the longest axis of the ellipsoid of their dielectric constants parallel to the lines of force. In favourable cases this orientation can be made almost complete, and in all cases the consequent double refraction can be accurately measured with an apparatus described. Under specified conditions the double refraction, which may approach the true double refraction of the solid, is a characteristic constant of the suspended substance. Measurements are given for sols of vanadium pentoxide, calcite, quartz, barytes, chabazite, actinolite, talc, and muscovite. The method is of par-

ticular value for the characterization of clays, and is applied to two clay acids and to several of their salts. It can be utilized to determine the equilibrium point in the reaction of clays with sparingly soluble salts, and it is shown that for the two clays examined the equilibrium between calcite and the sodium salt of the clay acids is very different. Clays are also found to have a characteristic degree of dispersion, dependent both on the cation and on the anion. Kaolin was found to contain two major constituents of refractive indices 1·550 and 1·568.　　　　　　　　　　　　　　M. H. H.

SCHNEIDER (W.). *Prüfung einiger Kristallarten auf piezoelektrischen Effekt.* Zeits. Physik, 1928, vol. 51, pp. 263–267.

The apparatus of E. Giebe and A. Scheibe (1925) for the determination of the piezo-electric effect of grains is described in more detail and a list of substances given in which the effect was or was not observed.　　　　　　　　　　　　　　　　　　　　F. A. B.

FORREST (J.). *Magnetic quality in crystals.* Phil. Mag., 1925, ser. 6, vol. 50, pp. 1009–1018.

—— *Magnetic quality in crystals : Part I. Discrimination of, and stability in, magnetic lattices.* Trans. Roy. Soc. Edinburgh, 1926, vol. 54, pp. 601–653, 32 figs. *Part II. Stability of magnetic lattices.* Ibid., pp. 655–679, 17 figs. *Part III. Twinning in crystals.* Ibid., pp. 681–701, 2 figs.

Simple methods are described of measuring the components of the intensity of magnetization of natural and artificial crystal plates parallel and transverse to the applied magnetic field, and curves are drawn showing the variation of susceptibility with direction for important planes of crystals belonging to each system of symmetry. On the whole the results confirm Peddie and Forrest's theory that the magnetic properties of crystals may be explained on the assumption that magnetic dipoles exist at the lattice points of the structure. The face-centred lattice is calculated to be the most stable of all the cubic lattices, and a contribution is also offered to the theory of twinning.　　　　　　　　　　　　　　　　　　　　　F. A. B.

FORREST (J.). *Magnetic anisotropy of cubic crystals.* Phil. Mag., 1927, ser. 7, vol. 3, pp. 464–476.

A more detailed treatment of the author's theory applied to cubic crystals in which he identifies the magnetic element with the atom. The experimental results previously obtained (see above) show that

cubic crystals exhibit marked magnetic anisotropy. The theory offers a satisfactory explanation.   F. A. B.

FOEX (G.). *Recherches sur la paramagnétisme.* Annales de Physique, 1921, vol. 16, pp, 174–305, 33 figs.

A detailed study of the change of susceptibility with temperature of aqueous solutions of salts, metals, alloys, artificial salts, and specimens of chalybite and dioptase. All show marked deviations from Weiss's law, particularly at low temperatures. The author accounts qualitatively for departures from the Weiss law, but does not find any evidence for quantization of magnetic phenomena.

F. A. B.

RABI (I. I.). *On the principal magnetic susceptibilities of crystals.* Physical Review, 1927, ser. 2, vol. 29, pp. 174–185, 4 figs.

If the susceptibility of a liquid be varied till a crystal oriented in this liquid in a known direction remains at rest when a magnetic field is applied, then the susceptibility of the liquid equals that of the crystal for the known direction. The author describes a new method of magnetic measurement based upon this principle and measures the principal susceptibilities of eleven paramagnetic crystals belonging to the monoclinic double sulphates studied by Tutton [M.A. **2**–102] and three diamagnetic crystals. The susceptibilities of the double sulphates seemed to depend only on the paramagnetic ion, whilst the two diamagnetic substances $NaNO_3$ and KNO_3 similar in their crystallographic properties to calcite and aragonite respectively also show similar magnetic properties.   F. A. B.

X-rays and Crystal-structure.

PATTERSON (A. L.). *Methods in crystal analysis. I. Fourier series and the interpretation of X-ray data.* Zeits. Krist., 1930, vol. 76, pp. 177–186. *II. The enhancement principle and the Fourier series of certain types of function.* Ibid., 1930, vol. 76, pp. 187–200, 1 fig. [Cf. M.A. **4**–97.]

These two papers present results obtained in the direct application of Fourier analysis to crystal-structure problems without the aid of parameter determination. In the first paper an appropriate form for the Fourier series representing the scattering power is discussed. A section follows on the effect of structural 'smearing out' upon the X-ray diffractions. In the second paper a rigorous mathematical derivation of W. H. Bragg's enhancement principle is given and its generalization discussed. An advance is made in the direct determina-

tion of crystal-structure by Fourier analysis; the difficulty involved in ambiguity of phase is reduced particularly in problems of the enhancement type where information on the structure can be obtained without any knowledge of the phases of the components.

F. A. B.

BRILL (Rudolf). *Über die röntgenographische Bestimmung von Form und Begrenzungsflächen submikroskopisch kleiner Kristalle.* Zeits. Krist., 1930, vol. 75, pp. 217–227, 4 figs.

The breadth of diffraction lines of powder photographs depends not only on particle size but also on the predominant form and shape of the particles. The author deduces the appropriate theoretical relations, and, from data previously obtained for samples of nickel containing sulphur [M.A. **4**–360], finds that the particles are bounded chiefly by octahedral planes and that the length perpendicular to (111) is three times as long as the breadth. F. A. B.

SANDER (B.) & SACHS (G.). *Zur röntgenoptischen Gefügeanalyse von Gesteinen.* Zeits. Krist., 1930, vol. 75, pp. 550–571, 24 figs.

A discussion is given of the application of X-ray methods to the study of rock-structures [M.A. **4**–340]. By moving a section containing oriented quartz crystals parallel to its own plane in the X-ray beam, powder photographs are obtained with certain rings enhanced in intensity. The statistic orientation of quartz crystals in the section is thence deduced, and thus the bridge gapped between those coarse-grained rocks in which the orientation can be studied by the Fedorov method and very fine-grained rocks which are suitable for ordinary X-ray powder photographs. Good reproductions are given of the X-ray photographs, and the methods of interpretation are fully discussed. F. A. B.

RANDALL (J. T.), ROOKSBY (H. P.), & COOPER (B. S.). *X-ray diffraction and the structure of vitreous solids—I.* Zeits. Krist., 1930, vol. 75, pp. 196–214, 2 pls., 8 text-figs.

LENNARD-JONES (J. E.). *Note on the dependence of crystal spacing on crystal size.* Ibid., pp. 215–216.

X-ray diffraction patterns were obtained for glassy silica, wollastonite, sodium borate, potassium borate, boric acid, soda and potash felspar, selenium, glucose, sucrose, and for soda-lime-silica and borosilicate glasses. The vitreous substances were found to be composed of crystallites of the order of magnitude $1/10^6$ to $1/10^7$ cm. Thus

the silica is made up of cristobalite, the wollastonite glass of hexagonal pseudo-wollastonite, and the sodium borate glass of $Na_2B_4O_7$ crystals. J. E. Lennard-Jones adds a note giving the mathematical explanation for the observed increase in the spacing of the crystal particles in glass.   H. H.

COHN (Willi M.). *Über einen Röntgenofen zur Vornahme von röntgeno-graphischen Untersuchungen bei hohen Temperaturen und über einige vorläufige Ergebnisse für Pentaerythrit und Quarz.* Zeits. Physik, 1928, vol. 50, pp. 123–136, 8 figs. [M.A. 3–334, 4–20, 21.]

A special camera is described for obtaining rotation and powder photographs of substances at temperatures up to 650° C. The specimen is heated partly by radiation from a hot spiral surrounding the specimen and partly by an upward stream of heated air. Powder photographs of pentaerythrite at temperatures up to 230° C. show a weakening in intensity and increase in breadth of high-order lines. In the case of β-quartz only the first effect was observed.

F. A. B.

KOTOH (Nobuyuki). *X-ray investigations on copper-arsenic alloys.* Zeits. Krist., 1930, vol. 76, pp. 228–234.

The copper-arsenic alloys form an α-phase of copper with dissolved arsenic not exceeding 4 %. For this the lattice is cubic face-centred, the edge of the unit cube being 3·608 Å. for pure copper and 3·640 Å. for copper with 4 % arsenic. They also form a β-phase with 28·6 to 29·6 % arsenic having a hexagonal unit cell containing six molecules for which the edges a and c vary from 7·121 and 7·293 Å. to 7·095 and 7·267 Å.   H. H.

BRAEKKEN (H.). *Zur Kristallstruktur des kubischen Karborunds.* Zeits. Krist., 1930, vol. 75, pp. 572–573, 1 fig.

The cubic modification of carborundum has the zinc-blende structure, the edge of the unit cell being 4·348 Å.   H. H.

WEVER (F.) & MÖLLER (H.). *Über den Kristallbau des Eisensilizides FeSi.* Zeits. Krist., 1930, vol. 75, pp. 362–365. [Cf. M.A. 4–361.]

The space-group of FeSi is T^4, and the unit cell contains four molecules and has an edge of length 4·467 Å. The positions of the atoms in the cell are completely determined.   H. H.

HEYWORTH (Dorothy). *Note on the space group of AsI_3.*

BRAEKKEN (H.). *Erwiderung auf obenstehende Bemerkung.* Zeits. Krist., 1930, vol. 75, p. 574.

The space-group of AsI_3 is C_3^4 or C_{3i}^2, not C_3^1, as previously given [M.A. 4–362]. H. H.

MENZER (G.). *Die Kristallstruktur von Kryolithionit.* Zeits. Krist., 1930, vol. 75, pp. 265–287, 3 figs.

Cryolithionite has the space-group O_h^{10}. The unit cell contains eight molecules of $Li_3Na_3Al_2F_{12}$ and has an edge of length 12·097 Å. H. H.

GOßNER (B.). *Über Boleit, Pseudoboleit und Cumengeit.* Zeits. Krist., 1930, vol. 75, pp. 365–367.

The author notes some differences between his own work [M.A. 4–272] and that of G. Friedel [M.A. 4–272] and of H. Hocart [M.A. 4–363], which he discusses in the light of the results obtained by a repetition of his own experiments. H. H.

AMINOFF (G.) & BROOMÉ (B.). *Contributions to the knowledge of the mineral pyroaurite.* Kungl. Svenska Vetenskapsakad. Handl., 1931, ser. 3, vol. 9, no. 5, pp. 23–48, 14 figs.

Pyroaurite ($Fe_2O_3.6MgO.15H_2O$) occurs in a trigonal and in a hexagonal modification. The structures cannot be obtained with certainty, but the unit cell of the hexagonal modification probably contains two molecules and the trigonal contains one. H. H.

AMINOFF (G.). *Lattice dimensions and space-group of braunite.* Kungl. Svenska Vetenskapsakad. Handl., 1931, ser. 3, vol. 9, no. 5, pp. 14–22, 4 figs.

Braunite has probably the space-group D_{4h}^{20}. The unit cell contains eight molecules of $3Mn_2O_3.MnSiO_3$ and has edges given by $a = 13·28$, $c = 18·58$ Å. H. H.

BRAEKKEN (H.) & HARANG (L.). *Die kubische Hochtemperaturstruktur einiger Perchlorate.* Zeits. Krist., 1930, vol. 75, pp. 538–549, 1 fig.

The cubic unit cell has an edge of length 7·08 Å. for $NaClO_4$ at 314° C., 7·50 Å. for $KClO_4$ at 310° C., 7·70 Å. for $RbClO_4$ at 300° C., 7·98 Å. for $CsClO_4$ at 230° C., 7·67 Å. for NH_4ClO_4 at 243° C., 7·00 Å. for $AgClO_4$ at 160° C., and 7·70 Å. for $TlClO_4$ at 280° C. The space-group is T_2^d and the unit cell contains four molecules. H. H.

CLOUSE (J. H.). *On the crystal structure of calcium chromate, $CaCrO_4$.* Zeits. Krist., 1930, vol. 76, pp. 285–286.

Needle-shaped crystals of calcium chromate are tetragonal. The unit cell contains four molecules of $CaCrO_4$ and has edges given by $a = 7·10$, $c = 6·19$ Å. The space-group is D_{4h}^{19}, and the substance is isomorphous with $ZrSiO_4$, YPO_4, and YVO_4. The salts $SrCrO_4$ and $PbCrO_4$ are isomorphous with monazite.   H. H.

GOßNER (B.) & MUßGNUG (F.). *Über Krokoit, Lautarit und Dietzeit und deren kristallographische Beziehungen.* Zeits. Krist., 1930, vol, 75, pp. 410–420.

The space-group of crocoite, lauterite (certainly), and dietzeite (probably) is C_{2h}^5. The unit cell has dimensions given by $a = 6·82$, $b = 7·48$, $c = 7·16$ Å., $\beta = 77° 27'$; $a = 7·18$, $b = 11·38$, $c = 7·32$ Å., $\beta = 73° 38'$; $a = 10·16$, $b = 7·30$, $c = 14·03$ Å., $\beta = 73° 28'$, respectively, and contains four molecules of $PbCrO_4$, CaI_2O_6, $CaI_2O_6.CaCrO_4$ respectively.   H. H.

MEHMEL (Martin). *Über die Struktur des Apatits. I.* Zeits. Krist., 1930, vol. 75, pp. 323–331, 2 figs.

The space group of apatite is C_{6h}^2. The unit cell contains two molecules of $(CaF)Ca_4(PO_4)_3$ and has edges given by $a = 9·36$, $c = 6·85$ Å.   H. H.

NÁRAY-SZABÓ (St.). *The structure of apatite $(CaF)Ca_4(PO_4)_3$.* Zeits. Krist., 1930, vol. 75, pp. 387–398, 4 figs.

The space-group of apatite is C_{6h}^2. The unit cell contains two molecules of $(CaF)Ca_4(PO_4)_3$, and has edges given by $a = 9·37$, $c = 6·88$ Å.   H. H.

WARREN (B. E.) & TRAUTZ (O. R.). *The structure of hardystonite $Ca_2ZnSi_2O_7$.* Zeits. Krist., 1930, vol. 75, pp. 525–528, 1 fig.

The space-group of hardystonite is D_{2d}^3. The unit cell contains two molecules of $Ca_2ZnSi_2O_7$ and has edges given by $a = 7·83$, $c = 4·99$ Å. The structure is very similar to that of melilite.

      H. H.

DUNBAR (C.) & MACHATSCHKI (F.). *Structure of danburite, $CaB_2Si_2O_8$.* Zeits. Krist., 1930, vol. 76, pp. 133–146, 6 figs.

The space-group of danburite is V_h^{16}. The unit cell contains four molecules of $CaB_2Si_2O_8$ and has edges given by $a = 8·75$, $b = 8·01$, $c = 7·72$ Å.   H. H.

WARREN (B. E.) & MODELL (D. I.). *The structure of anthophyllite* $H_2Mg_7(SiO_3)_8$. Zeits. Krist., 1930, vol. 75, pp. 161–178, 5 figs.
    The space-group of anthophyllite is V_h^{16}. The unit cell contains four molecules of $H_2Mg_7(SiO_3)_8$ and has edges given by $a = 18 \cdot 5$, $b = 17 \cdot 9$, $c = 5 \cdot 27$ Å. The atomic arrangement in the cell is determined. Reasons are given for preferring the formula $H_2Mg_7(SiO_3)_8$ to the usual $MgSiO_3$.   H. H.

JAEGER (F. M.), WESTENBRINK (H. G. K.) & MELLE (F. A. van). *Roentgenspectrographic investigations on the structure of the artificial ultramarines and the problem concerning their relations to the minerals hauyne, nosean, sodalite, lazurite and nephelite.* Proc. Sect. Sci. Akad. Wiss. Amsterdam, 1927, vol. 30, pt. 1. pp. 249–267, 1 fig.

JAEGER (F. M.) & MELLE (F. A. van). *Investigations into the constitution of artificial ultramarines. II. On ultramarine-blue with high silica-content and on silver-, silversodium-, selenium- and silverselenium-ultramarines.* Ibid., 1927, vol. 30, pt. 1, pp. 479–498, 3 figs.

JAEGER (F. M.) & MELLE (F. A. van). *Investigations into the structure of the artificial ultramarines. III. On silver- and alcali-silverultramarines which are derivatives of Guimet's ultramarine-blue with high silica content, and on mixed alcali-ultramarines and norm. butyl-silver-ultramarine.* Ibid., 1927, vol. 30, pt. 2, pp. 885–904, 4 figs.

JAEGER (F. M.). *Investigations about the structure of artificial ultramarines, IV. On ultramarines of thallium and on the analogous derivatives of the bivalent metals calcium, strontium, barium, zinc, manganese, and lead.* Ibid., 1929, vol. 32, pt. 1, pp. 156–166, 1 fig.

JAEGER (F. M.) & MELLE (F. A. van). *Investigations about the structure of the artificial ultramarines. V. On absorption-phenomena with ultramarine and on the structure of nosean, hauyne, and the ultramarines.* Ibid., 1929, vol. 32, pt. 1, pp. 167–181, 3 figs.

JAEGER (F. M.). *On the constitution and the structure of ultramarine.* Trans. Faraday Soc. London, 1929, vol. 25, pp. 320–345, 3 figs.

JAEGER (F. M.). *Sur les outremers naturels et artificiels.* Bull. Franç. Min. Soc., 1930, vol. 53, pp. 183–209, 1 pl., 4 text-figs.

    Powder photographs of various artificial ultramarines varying in silica content and degree of sulphuration are identical with each other

and with powder photographs of nosean and haüyne from Monte Somma, Mt. Vesuvius, Italy. The body-centred unit cell has an edge $a = 9.11$ to 9.13 Å., containing the radicle $(Na_8Al_6Si_6O_{24})^{..}$ which is considered to be a 'fixed' constituent of the ultramarine structure. From rotation photographs of nosean and haüyne crystals a probable structure is deduced for the 'fixed' component, a three-dimensional network of linked SiO_4 and AlO_4 tetrahedra. Although the unit cell is body-centred the most probable space-group for nosean is considered to be T_d^4. The $(SO_4)''$ ions are supposed to occupy fixed positions in the nosean structure, but two $Na^.$ ions are assumed to be 'wandering' constituents. In the ultramarine structure still more constituents are considered 'wandering'. The mobility of the 'wandering' $Na^.$ ions is responsible for the property of base-exchange in ultramarines. An X-ray study was also made of other minerals thought to be closely related to the ultramarines. Rotation and powder photographs of sodalite from Monte Somma yield a cubic unit cell containing $Na_8Al_6Si_6O_{24}Cl_2$, whose cell edge is 8.81 Å. [M.A. 4–367]. Similarly, analcime crystals from the Cyclopean Isles, Sicily, have a cubic unit cell of edge 13.71 Å. containing $16(NaAlSi_2O_6.H_2O)$ [M.A. 4–369]. The space group is O_h^{10}. Nepheline crystals from Monte Somma have an hexagonal unit cell whose edges are $a = 9.87$, $c = 8.38$ Å.; the rhomb-based cell contains $8NaAlSiO_4$; the space-group is C_6^6 [M.A. 3–344,4–368]. A study is also made of numerous substitution products of the ultramarines and the conditions of substitution.   F. A. B.

PAULING (Linus). *The structure of some sodium and calcium alumino-silicates*. Proc. Nat. Acad. Sci. U.S.A., 1930, vol. 16, pp. 453–459, 5 figs.

Oscillation and Laue photographs of natrolite yield an orthorhombic unit cell $a = 18.19$, $b = 18.62$, $c = 6.58$ Å., containing eight molecules $Na_2Al_2Si_3O_{10}.2H_2O$. The space-group is C_{2v}^{19}. Strings of linked tetrahedra of Si and O, and Al and O are proposed as the chief feature of the framework of the natrolite structure. Channels in this structure account for easy escape of water on heating and also for the phenomenon of base-exchange. Scolecite has probably a similar structure, the replacement of 2Na by Ca and H_2O lowering the symmetry. Oscillation and Laue photographs of meionite from Mt. Vesuvius, Italy, and scapolite from Bedford Ontario, show that the true unit cell has its a-axis inclined 45° to the crystallographic axis. The tetragonal unit cell of meionite contains two molecules

$Ca_4Al_6Si_6O_{24}(SO_4,CO_3)$. Its dimensions are $a = 12·27$, $c = 7·66$ Å. The same dimensions are given for scapolite, and its cell contents correspond to a composition intermediate between that for meionite and that for marialite $Na_4Al_6Si_6O_{24}Cl$. The space-group for both minerals is C_{4h}^5, C_4^5, or S_4^2. The proposed structure also consists of strings of linked Si–O and Al–O tetrahedra. Observed intensities of reflections of even order from (00*l*) are in agreement. Rings of six tetrahedra, the fundamental unit in beryl, &c., joined by sharing corners yield an hexagonal structure with $a = 12·8$, $c = 5·4$ Å., values in close agreement with Gossner and Mussgnug's determinations for davyne and cancrinite [M.A. 4–279]. This proposed structure has channels of 6 Å. in diameter running parallel to the *c*-axis. The author correlates the increase of Al–O–Si bond-density in the structures proposed for the alkali aluminosilicates with the decrease in ease of cleavage.   F. A. B.

PAULING (Linus). *The structure of the chlorites.* Proc. Nat. Acad. Sci. U.S.A., 1930, vol. 16, pp. 578–582, 3 figs.

Oscillation and Laue photographs of pennine and clinochlore yield a monoclinic unit cell with $a = 5·2–5·3$, $b = 9·2–9·3$, $c = 14·3–14·4$ Å., $\beta = 83° 10'$, containing two molecules $Al_2Mg_5Si_3O_{16}(OH)_8$ [i.e. $Al_2Mg_5Si_3O_{10}(OH)_8$]. The space-group is C_{2h}^3. The close approximation of the values of a and b to those for the micas indicates that the chlorites also are composed of tetrahedral and octahedral layers [M.A. 4–368]. Comparison of the relative intensities of reflection of various orders from (001) of pennine are in agreement with the suggested structure of alternating mica and brucite layers. The structure leads to the formula $X_mY_4O_{10}(OH)_8$ with $4 \leqslant m \leqslant 6$. Y represents cations of co-ordination number 4 and varies within the range between Si_3Al and Si_2Al_2. X represents cations of co-ordination number 6 and for $m = 6$ varies between Mg_5Al and Mg_4Al_2 with Fe^{II} and Mn^{II} sometimes partially replacing Mg^{II}, and Fe^{III} replacing Al^{III}. The cleavage lamellae of chlorite while tough are not elastic as in the micas, for the effect of the potassium ions in keying adjacent layers is absent. The proposed structure also accounts for many other well-known properties of the chlorites.   F. A. B.

MAUGUIN (Ch.). *La maille cristalline des chlorites.* Bull. Soc. Franç. Min., 1930, vol. 53, pp. 279–300, 6 pls., 8 text-figs. [M.A. 4–33.]

Laue photographs of specimens of: I, Prochlorite-grochauite, Carter mine, Democrat, Madison Co., [North Carolina]; II, Leuchtenbergite,

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Beramy, Midongy West, Madagascar; and III, Pennine, Zermatt, Switzerland; all show trigonal symmetry and appear to have a rhombohedral or pseudo-rhombohedral cell. IV, amesite, Chester, Massachusetts [M.A. **1**–71], however, gives a hexagonal Laue pattern, and its unit cell is a hexagonal prism. Rotation photographs yield for the edges a and b of the monoclinic cell centred on c (001) and its length c' perpendicular to (001):

	a.	b.	c'.	
I.	5·30	9·18	14·15 Å.	
II.	5·32	9·21	14·15	II and III studied by Orcel
III.	5·34	9·24	14·33	[M.A. **3**–372].
IV.	5·35	9·27	14·00	

The unit cell is found to contain 18 oxygen atoms and 8 hydrogen atoms, the total number of electropositive ions always summing to 18 per unit cell. The rotation photographs about the y axis have nos. 1, 2, 4, 5, &c., layer lines very weakly developed, only the 3rd, 6th, 9th, &c., being strong as in the case of biotite [M.A. **4**–32–33, 160]. The choice of a cell one-third the size results, however, in the number of hydrogen atoms which remains constant from one chlorite to another being fractional. The author, therefore, has suggested repeated twinning about the normal to (001) as the explanation of the very weak layer lines noted above. Assuming the cell dimensions, which show very small variations, the number of atoms per unit cell is also calculated for a number of other chlorites studied by Orcel [M.A. **3**–372] from which the author deduces the general formula $Si_{3-x}Al_{2+2x}Mg_{5-x}H_8O_{18}$. Finally, some conclusions are drawn as to the probable structure by comparing the two lattices of mica and chlorite.   F. A. B.

WARREN (B. E.) & BRAGG (W. Lawrence). *The structure of chrysotile* $H_4Mg_3Si_2O_9$. Zeits. Krist., 1930, vol. 76, pp. 201–210, 4 figs.

Chrysotile has probably the space-group C_{2h}^3. The monoclinic unit cell contains four molecules of $(OH)_6Mg_6Si_4O_{11}.H_2O$ and has dimensions given by $a = 14·66$, $b = 18·5$, $c = 5·33$ Å., $\beta = 86° 44'$.   H. H.

HALLA (Franz) & MEHL (Ernst). *Das Raumgitter des Natroliths*. Zeits. Krist., 1930, vol. 75, pp. 421–429, 1 pl.

The unit cell of natrolite contains eight molecules of $Na_2Al_2Si_3O_{10}.2H_2O$ and has edges given by $a = 18·384$, $b = 18·715$, $c = 6·632$ Å. The space-group is V_h^{23}, C_{2v}^{18}, or V^7.   H. H.

JACKSON (W. W.) & WEST (J.). *The crystal structure of muscovite—* $KAl_2(AlSi_3)O_{10}(OH)_2$. Zeits. Krist., 1930, vol. 76, pp. 211–227, 8 figs.

Muscovite has the space-group C_{2h}^6. The monoclinic unit cell contains four molecules of $KH_2Al_3(SiO_4)_3$ and has dimensions given by $a = 5·18$, $b = 9·02$, $c = 20·04$ Å., $\beta = 84° 30'$. The positions of the atoms in the cell are completely determined, and a close connexion between the structures of diopside, tremolite, and muscovite is established.　　　　　　　　　　　　　　　　　　　　　H. H.

HENGSTENBERG (J.) & KUHN (R.). *Notiz über eine röntgenographische Molekulargewichtsbestimmung des Methylbixins.* Zeits. Krist., 1930, vol. 76, pp. 174–176, 3 figs.

From the formula $Vd = 1·65MZ$, where V is the volume of the unit cell in Ångström units, d the density, M the molecular weight, and Z the number of molecules in the unit cell, we can get M when V, d, Z are known. For instance, in pseudo-orthorhombic methylbixin we have approximately $a = 10·5$, $b = 17·6$, $c = 13·4$ Å. and $d = 1·10$, giving $MZ = 1647$ to within 2·5 %. This is in accordance with $Z = 4$ and the formula $C_{26}H_{32}O_4$ for methylbixin, whereas no integral value of Z fits in with the formula $C_{24}H_{30}O_4$, which has also been suggested.　　　　　　　　　　　　　　　　　　　　　　　　　　　　H. H.

HENGSTENBERG (J.) & KUHN (R.). *Die Kristallstruktur der Diphenyl-polyene.* Zeits. Krist., 1930, vol. 75, pp. 301–310, 5 figs.

The following data were obtained for the diphenylpolyenes, in which two benzene rings are connected by the group $(CH = CH)_x$, for values of x ranging from 2 to 7 :

		Cell dimensions in Å.					No. of mols.	Space-
x.		a.	b.	c.	β.	D.	in unit cell.	group.
2	...	7·71	11·70	13·41	83°	1·138	4	C_{2h}^2
3	...	6·33	7·43	14·43	90	1·139	2	C_{2h}^5
4	...	6·25	7·44	16·03	90	1·144	2	C_{2h}
5	...	10·25	7·66	21·2	90	1·152	4	V_h^{15}
6	...	10·20	7·60	23·58	90	1·135	4	Rhombic
7	...	10·2	7·57	25·95	90	1·130	4	Rhombic

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WYCKOFF (Ralph W. G.). *A powder spectrometric study of the structure of urea.* Zeits. Krist., 1930, vol. 75, pp. 529–537, 2 figs.

The degree of accuracy obtainable by powder spectrometry was determined by its application to the case of urea, whose structure

was already known.   It is concluded that the method is a practical and useful way of investigating the structures of simple organic crystals.   H. H.

Topographical Mineralogy.

List of mines in Great Britain and the Isle of Man, Year 1929.   Mines
      Department, London, vi + 380 pp.   Price 5s. 6d.

The annual volumes of this series [M.A. 2–23] showed an increase in price from 10s. 6d. to 18s. 6d. for the year 1928.   The current issue is very considerably reduced in price to 5s. 6d., but without change in the size and arrangement of the volume.   L. J. S.

Catalogue of plans of abandoned mines.   Mines Department, London,
      1929, vol. 3, iii + 412 pp., price 15s. ; 1930, vol. 4, iii + 438 pp.,
      price 15s.

These volumes are continued on the same lines as the previous volumes [M.A. 4–178]. Vol. 3 deals with the counties of Derby, Leicester, Lincoln, Norfolk, Northampton, Nottingham, Oxford, Warwick, and York ; and vol. 4 with Monmouth, Salop, and twelve counties in Wales.   A fifth volume on Scotland is in preparation.

L. J. S.

JENKIN (A. K. Hamilton).   *The Cornish miner : an account of his life
      above and underground from early times.*   London (George Allen
      & Unwin), 1927, 351 pp., 8 pls.   Price 12s. 6d.

This book gives an interesting and readable account of the history of Cornish mining up to the year 1870 before the introduction of modern methods.   Particular reference is made to the life of the miners with many curious anecdotes.   The index contains a long list of mines referred to in the text.   L. J. S.

BROWN (Robert).   *The mines and minerals of Leadhills.*   Trans.
      Dumfriesshire & Galloway Nat. Hist. Antiq. Soc., 1919, ser. 3,
      vol. 6 (for 1918–19), pp. 124–137.
—— *More about the mines and minerals of Wanlockhead and Leadhills.*
      Ibid., 1927, ser. 3, vol. 13 (for 1925–26), pp. 58–79.

An account of the history and working of the lead mines at Lead-hills in Lanarkshire and Wanlockhead in Dumfriesshire, with notes on the minerals observed and collected by the author.   A list of 72 minerals recorded from the district is added, together with a list of 40 pseudomorphs.   Crocoite is recorded as a mineral new to Britain.

Alluvial gold has been collected in small amounts at Leadhills, and a few lumps of gold-bearing quartz have been found.   L. J. S.

A survey of the mineral position of the British Empire. Imperial Institute, Mineral Resources Department, London, 1931, 121 pp. Price 2s.

This brochure was issued in connexion with a temporary exhibition at the Imperial Institute of the economic minerals of the British Empire.   Under each country is given a brief account of its mineral resources, with statistics of exports and imports of various minerals. An instructive table gives the percentage for the British Empire of the world's output ; e.g. for the year 1928 : asbestos 90·2, nickel 89·6, diamonds 74·7, gold 72·5, chrome ore 63·5, mica 53·6, tin 47·0, manganese ore 44·8, . . . potash 0·1 %.   L. J. S.

AMINOFF (Gregori).   *Contributions to the mineralogy of Långban I–IV.* Kungl. Svenska Vetenskapsakad. Handl., 1931, ser. 3, vol. 9, no. 5.   *I. Notes on the mineral deposit of Långban from a chemical point of view.*   Pp. 4–13, 3 figs.   [Four other notes, II–V, occupy pp. 14–57.]

The relative abundance of the 30 chemical elements detected from this locality is calculated.   There is a special concentration of Fe, Mn, Pb, Ba, and As.   The 96 minerals recorded are listed with their chemical composition.   A small geological map is given.

L. J. S.

AMINOFF (G.).   *Three minerals new for Långban.*   Kungl. Svenska Vetenskapsakad. Handl., 1931, ser. 3, vol. 9, no. 5, pp. 49–51.

The three new minerals are domeykite, native arsenic, and phenakite.   The first gave on analysis by K. Johansson, Cu 71·45, As 27·98, insol. 0·28 = 99·71, agreeing with Cu_3As.   H. H.

BIANCHI (Angelo) & CAVINATO (Antonio).   *I minerali del Miage (Monte Bianco) versante italiano.*   Atti Soc. Ital. Sci. Nat., 1925, vol. 64, pp. 132–174, 4 figs.

Sphene, epidote, quartz, apatite, anatase, adularia, and albite occur in the geodes in the amphibole-schists at the foot of Mont Brouillard, on the Italian side of Mont Blanc.   The schists are described in detail.   The quartz crystals show the new forms $(0.21.\overline{21}.1)$, $(0.25.\overline{25}.1)$, and $(0.15.\overline{15}.2)$.   The epidote (anal. I) is very rich in faces, including a new form $(0.8.13)$ $[a : b : c = 1\cdot5824 : 1 : 1\cdot8072,$

$\beta = 64° 34'$]. It is strongly pleochroic, α greenish-yellow, β yellow-brown, γ bottle-green ; $\alpha : c = 2° 50'$, 2V 76° 30', negative, β 1·749. Apatite crystals were also measured and their refractive indices determined, and anatase crystals measured. Albite (anals. II, III) showed the new forms d (3.$\overline{11}$.0), ($\overline{1}.\overline{1}$.15), and t ($\overline{1}17$) [Des Cloizeaux's axes]. The extinction-angle on (001) is 4° to the trace of (010), and on (010) 19° to the trace of (001). In aplites and sericite-schists from various parts of the Miage glacier, zeolites were observed. Heulandite, sp. gr. 2·225, had 2E 52° 30′ (red light), α 1·501, β 1·502. Stilbite (anal. IV) gave α 1·492, γ 1·502. The double refraction of stilbite as given in the literature is too low, and specimens from several localities gave $\gamma - \alpha$ 0·010–0·012. Scolecite forms twin-crystals of the unusual simple habit $o\,m\,\underline{o}\,\underline{m}$; $a : b : c = 0.9733 : 1 : 0.3281$, $\beta = 88° 34'$. The crystals (anal. V) gave $\gamma - \alpha$ 0·009, β 1·515, 2E 54° negative, $\alpha : c = 17°$. A radiating mass of white scolecite crystals gave anal. VI.

	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	Na_2O.	H_2O.	Total.	Sp. gr.
I.	37·60	24·02	12·86	23·67	—	2·08	100·41*	3·430
II.	66·87	20·29	—	0·90	12·00	—	100·06	2·62
III.	67·31	19·93	—	0·25	12·10	—	99·59	2·618
IV.	55·82	16·10	—	8·29	0·75	18·87	99·83	2·14
V.	45·96	26·10	—	13·91	—	13·97	99·94	2·270
VI.	45·67	25·93	—	13·80	—	14·41	99·81	2·262

* I, also MgO 0·12, MnO 0·06.

M. H. H.

GALLITELLI (P.). *Nota di mineralogia Modenese.* Atti Soc. Nat. Mat. Modena, 1929, ser. 6, vol. 8 (60), pp. 86–97, 3 figs.

Calcite from crevices in diabase at Toggiano gave analysis I of colourless crystals, for which many crystal-forms are noted ; II greyish ferromagnesian calcite on the colourless crystals ; and III of associated ankerite, rr 73° 39′.

	CO_2.	CaO.	FeO.	MnO.	MgO.	H_2O.	Total.	Sp. gr.
I.	43·48	55·46	—	1·88	—	—	100·82	2·725
II.	43·84	34·04	13·05	1·71	7·28	0·24	100·16	2·934
III.	45·75	29·01	10·73	—	14·47	0·17	100·13	2·940

From Boccassuolo are described crystals of pyrite, octahedra of magnetite, chlorite, and datolite. The greyish-green chlorite has n 1·58, sp. gr. 2·749 and gave SiO_2 28·50, TiO_2 0·80, Al_2O_3 20·24, Fe_2O_3 1·09, FeO 6·27, MgO 30·78, CaO 1·22, $H_2O +$ 11·68, $H_2O -$ 0·12 = 100·70, and is thus a prochlorite. The opaque white fibrous

datolite (botryolite) occurring in veins in diabase, has n 1·650, sp. gr. 2·939, and gave SiO_2 37·20, $Fe_2O_3 + Al_2O_3$ 1·64, CaO 34·50, B_2O_3 (21·11), H_2O 5·55 = 100·00. Baryte, grey and columnar, from shale at Marano gave IV ; white laminated material with datolite in diabase at Toggiano gave V.

	SO_3.	BaO.	SrO.	CaO.	Fe_2O_3.	H_2O.	Total.	Sp. gr.
IV.	34·44	61·58	2·70	trace	0·60	0·31	99·63	4·389
V.	34·76	63·30	2·10	trace	—	0·18	100·34	4·391

L. J. S.

MONTANARO (E.). *Contributo alla conoscenza dei minerali dell' Appennino Modenese.* Atti Soc. Nat. Mat. Modena, 1930, ser. 6, vol. 9 (61), pp. 53–65, 1 fig.

A short account is given of previous work and of the geology of the region. Intrusions of diabase and gabbro occur between the Eocene and Miocene sediments. From material in the Mineralogical Museum of the University of Modena, haematite, anatase, epidote, hedenbergite, and ilvaite are recorded as new for this region. Anatase as pyramidal crystals ($p\,c\,e$) from S. Biagio near Sestola shows the new form (554). Ilvaite, massive, with pyrite in limestone from Marano gave SiO_2 30·96, Fe_2O_3 20·46, FeO 30·04, MnO 3·23, CaO 14·56, alkalis traces, H_2O 0·53 = 99·78. Chlorite from Toggiano gave SiO_2 39·60, Al_2O_3 16·22, Fe_2O_3 9·61, FeO 8·56, MnO 1·78, MgO 12·24, CaO 5·14, H_2O+ 110° 6·23, H_2O- 110° 1·20 = 100·58, sp. gr. 2·804. Other minerals described are sulphur, blende, pyrite, quartz, cuprite, magnetite, calcite, aragonite, diallage, datolite, prehnite, serpentine, laumontite, asbestos, talc, baryte, gypsum. L. J. S.

KRENNER (Josef) [1839–1920], [edited, with notes, by] ZIMÁNYI (K.). *Mineralogische Mitteilungen aus Ungarn.* Centr. Min., Abt. A, 1930, pp. 112–117, 159–166, 251–255, 31 figs. [Cf. M.A. 4–332.]

13. Zircon (pp. 112–113. 2 figs.).—Small crystals in syenite from Ditró, and in sands from Tihany and Oláhpián. 14. Smithsonite from Rézbánya (pp. 113–114).—The reported occurrences are doubtful. 15. Idocrase from Csiklova (pp. 114–116, 3 figs.).—Description of the yellow-brown crystals in blue calcite ; 14 forms are listed. 16. Prehnite from Tiszafa, Banat (pp. 116–117, 1 fig.).—Single crystals $c\,m\,v$ [Dana's letters] gave 2V 70° 14′, β 1·621. 17. Stephanite from Vihnye (pp. 159–160, 5 figs.).—Prismatic and tabular crystals ; 18 forms. Andorite from Felsőbánya (pp. 160–161, 4

figs.).—12 forms.   19. Semseyite from Felsőbánya (pp. 161–162, 5 figs.).—6 forms.   20. Bustamite from Kapnikbánya (p. 162).—Analysis by J. Loczka, SiO_2 50·96, MnO 42·20, FeO 1·38, MgO 0·65, CaO 4·95 = 100·14, corresponds with $6(Mn,Fe)SiO_3.1(Ca,Mg)SiO_3$ with 7·70 % quartz; sp. gr. 3·5636.   21. Rhodonite from Rudabánya and Verespatak (p. 163).—With pyrite and native gold.   22. Veszelyite from Vaskő (p. 163).—Small malachite-green crystals, m (110), d (011), gave $a : b : c = 0.7286 : 1 : 0.9719$, $\beta = 76° \ 40'$ [i.e. $76° 38\frac{1}{4}'$]; optic axial plane (010), $\gamma : c = -23° \ 28'$, 2H 69° 16', positive.   No arsenic was found, and the mineral is believed to be a hydrous copper phosphate.   [Cf. Min. Mag. **19**–72; M.A. **3**–269, 361.]   23. Wavellite from Kapnikbánya (pp. 163–165, 4 figs.)—Small prismatic crystals forming radial aggregates with the forms $b \ m \ p \ s$ [Dana's letters; the table of measured and calculated angles corresponds with $a : b : c = 0.5547 : 1 : 0.4033$; cf. M.A. **2**–187].   There is good cleavage (110), but the cleavages $b \ p$ given by Senff [1830] are not present. H. $3\frac{1}{2}$, sp. gr. 2·342.   Optic axial plane (100), $Bx_a \perp$ (001), 2V 73° 40' (Na), positive, β 1·499.   24. Hatchettine from Sósmező, com. Háromszék (p. 166).—Platy crystals ($\frac{1}{2}$–1 cm.) in clay with prisms (110) (130) at the edges, $m \ m$ 65° 32'.   Optic axial plane (100), $Bx_a \perp$ (001), 2E 41° 10', positive.   When slightly warmed the crystals volatilize; they are insoluble in alcohol and only difficultly soluble in ether.   25. Orthoclase from Csiklova (p. 251).—Adularia crystals on garnet.   26. Anorthite from Aranyer Berg (pp. 251–252, 1 fig.).—Small thin six-sided plates on the walls of cavities in andesite; 15 forms.   27. Gold from Verespatak (pp. 253–255, 6 figs.).—By the development of certain faces of the icositetrahedron (311) hexagonal bipyramids and rhombohedral forms may result; these distorted forms combined with a platy extension of the octahedron and with twinning on (111) explain the complex platy and wiry forms of gold from this locality.   L. J. S.

Koch (Sándor).   *Adatok Magyarország ásványainak ismeretéhez.—Beiträge zur Kenntnis der Mineralien Ungarns.*   Ann. Hist.-Nat. Musei Nationalis Hungarici, 1928, vol. 25, pp. 439–447 (Hung.), pp. 448–450 (Germ. summary), 5 figs.

(1) Proustite and pyrargyrite from Felsőbánya.—Small crystals with the forms $m \ a \ r \ e \ v$ and $m \ a \ r \ e \ E \ q$ respectively [Dana's letters]. (2) New occurrence of volcanic haematite in the Hargita Mts.—Tabular crystals embedded in clay in a crevice in weathered andesite

show the forms $c\,a\,r\,\mu\,n\,V\,\chi$. (3) Goethite from Kissvábhegy, near Budapest.—Bundles of fine needles, $c\,b$ and (301). (4) Limonite and haematite pseudomorphous after marcasite from Farkasvölgy near Budapest. (5) Rhodochrosite from Kapnikbánya.—Small scalenohedral crystals, $c\,a\,r\,s\,v$. (6) Cerussite from Felsőbánya.— Small crystals, $b\,m\,x\,i\,p$, not before observed at this locality. (7) Apatite from Ratkószuha.—Tabular crystals in cavities in dolomite show the forms $c\,m\,a\,r\,x\,y\,s$. (8) Pyromorphite from Rézbánya.— Grass-green crystals, $m\,x$, in cavities in sandstone.   V. Z.

Giușcă (Dan). *Sur quelques minéraux de Transilvanie.* Bull. Sect. Sci. Acad. Roumaine, 1929, vol. 12, pp. 142–149 (= no. 6, pp. 10–17), 5 figs.

Baryte crystals from Baia Sprie (= Felsőbánya) are described and new forms (0.31.10) and (746) noted [$a : b : c = 0{\cdot}8152 : 1 : 1{\cdot}3136$]. In all, 24 crystal-forms have been observed on baryte from this locality. Baryte and fluorite crystals from Kapnik[1] are briefly described. Augite crystals from weathered andesite-tuff are described from the Bistra and Tihul valleys in the Călimani Mts.   L. J. S.

Rodolico (Francesco). *Note su alcuni minerali dell'Albania setten-trionale.* Periodico Min. Roma, 1931, vol. 2, pp. 5–12, 1 pl., 2 text-figs.

Chromite from Mt. Rums, northern Albania, gave Al_2O_3 12·01, Cr_2O_3 57·70, Fe_2O_3 3·63, FeO 12·67, MnO trace, MgO 13·17, CaO 0·92, SiO_2 0·19 = 100·29, sp. gr. 4·39, proving it to be chrompicotite. Diallage from Mt. Rums, greyish-green, with lamellar structure parallel to (100) and (001), $c : \gamma = 37°$, gave SiO_2 50·56, TiO_2 0·23, Al_2O_3 2·43, Fe_2O_3 3·18, FeO 2·05, MnO trace, MgO 18·06, CaO 19·92, H_2O 3·38 = 99·81, sp. gr. 3·30. Pyrite from Kalivari, as pentagonal-dodecahedra twinned on (110) and with the forms $e\,\theta\,a\,o\,n\,p$. Sulphur from Mt. Bard, Korab Mts., as corroded crystals on a gypsum-rock.
                                                                    L. J. S.

Swaminathan (V. S.). *Mineral resources of Madras, Mysore and Travancore.* Trans. Mining Geol. Inst. India, 1930, vol. 25, pp. 81–175, 1 pl. (map).

A summary with bibliography is given of the geology and the occurrence of a large number of economic minerals, together with several new chemical analyses. This area contributes the whole of the magnesite, ilmenite, zircon, monazite, and gold of the Indian

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[1] Felsőbánya and Kapnik are not in Transylvania.

output. Chromite, manganese ore, steatite, and mica are also of some importance. L. J. S.

BADYAL (L. R.). *A short description of the mineral resources of Jammu and Kashmir State.* With a note on the geology by C. S. MIDDLE-MISS. Mineral Survey Reports, Jammu & Kashmir Government, London, 1931, 19 pp.

A summary of published reports, a list of which is given. [M.A. **1**–130, **4**–78.] L. J. S.

SCRIVENOR (J. B.). *The geology of Malaya.* London (Macmillan & Co.), 1931, xx + 217 pp., 1 map, 33 text-figs. Price 16s.

This volume and the companion volume on ' The geology of the Malayan ore-deposits ' [M.A. **3**–511] are by the Director of the Geological Survey and are published with the authority of the Federated Malay States Government. Chapter XI of mineralogical notes incorporates and supplements the information given in E. S. Willbourn's list of Malayan minerals [M.A. **3**–126]. Mention is made of tektites [M.A. **1**–407]. Chapter XII deals with rocks and minerals of economic interest other than ores, and includes abrasives, asbestos, china-clay, nitre, &c. A bibliography of 241 items is added, and the good geological map, dated 1930, is on the scale of 12 miles to 1 inch.
L. J. S.

TORGASHEFF (Boris P.). *The mineral industry of the Far East.* Shanghai (Chali Co.), 1930, iv + 512 pp., 14 pls. (maps). Price 40s.

This book is a translation from the Russian, and contains prefaces by W. H. Wong and P. I. Polevoy, the Directors of the Geological Surveys of China and the Russian Far East respectively. It covers China with Manchuria, Japan with Korea and Formosa, the Philippine Islands, and Indo-China. A general sketch is given for each of these countries, and then a long series of metallic ores and non-metallic minerals are dealt with in separate chapters. Much of the information is statistical, there being 320 statistical tables, and also a bibliography of 268 items. L. J. S.

AHNERT (E. E.). *The mineral resources of north Manchuria.* Mem. Geol. Survey China, Ser. A, 1929, no. 7, 242 pp. (English), 107 pp. (Chinese), 14 pls., 9 maps, 14 pls.

This is a translation from the Russian with later additions. The geographical features, geology, and mineral deposits are described.

On pp. 143–188 is given a tabulated list of the deposits of useful minerals, the most important of which are placer gold and coal.

L. J. S.

MOUNTAIN (E. D.). *Pegmatites of the Cape Province.* Rec. Albany Museum, Grahamstown, 1931, vol. 4, pp. 122–144, 1 pl., 1 text-fig.

An account is given of the minerals present in the pegmatite veins traversing the older granite and gneiss in the north-western portion of Cape Province, South Africa. Essential minerals are quartz (sometimes rose-quartz), felspars (microcline, usually white, but sometimes green amazon-stone), and micas (muscovite, biotite, rarely lepidolite). Accessory minerals are apatite, beryl (crystals up to 3 feet long from the Steinkopf district, Namaqualand), bismuth, calcite (clear masses of Iceland-spar up to 10 lb. from the Kenhardt division), corundum, fluorite, garnet, haematite, hornblende, magnetite, scorodite, spodumene (crystals to 4 feet long from Jackals Water, Steinkopf), sulphides (pyrite, mispickel, bornite, chalcopyrite), tourmaline, triplite (massive from Kenhardt), and the following minerals containing rare elements. Allanite as large masses and smaller crystals ($c\,i\,r\,l\,o$) from Boksput, Gordonia; mostly isotropic with n 1·655–1·674, sp. gr. 3·36, analysis I. Columbite-tantalite as large lumps and crystals from Jackals Water near Steinkopf; sp. gr. 5·23–6·40 (analyses quoted). Euxenite from Steyns Puts, Kenhardt (analysis quoted). Fergusonite as rounded prismatic crystals from Onseepkans, Kenhardt; optically isotropic with n 1·95, sp. gr. 5·013; an approximate analysis gave $Nb_2O_5 + Ta_2O_5$ 43·35, Yt_2O_3 &c. 53·20, H_2O 3·08 = 99·63. Fergusonite from Boksput, Gordonia, has n 2·05, sp. gr. 5·558, H_2O 1·31 %. Gadolinite as good crystals ($c\,b\,a\,m\,l\,w\,q\,y$ $f\,p\,o\,i$) from Onseepkans and Boksput; crushed fragments are grass-green and isotropic with n about 1·776; sp. gr. variable, mean 4·085; analysis II by R. F. H. Hellings.

	SiO_2.	ThO_2.	Yt_2O_3.	Ce_2O_3.	Al_2O_3.	Fe_2O_3.	FeO.	BeO.	MgO.	CaO.	H_2O.
I.	30·97	1·70	—	17·72	16·04	10·49	5·29	—	0·49	9·16	7·99
II.	24·80	—	44·32	7·70	—	2·04	9·09	11·35	—	0·50	0·99

Pitchblende (uraninite) from Boksput, Gordonia, as cubes, often distorted with the appearance of flat square pyramids; sp. gr. 8·876, anal. III. Partly altered pitchblende, greyish-black with feeble metallic lustre, has sp. gr. 7·443, and contains thoria and rare-earths 22·78 %, H_2O 3·50 %. A pale-yellow earthy alteration product of

pitchblende has n 1·74, sp. gr. 4·222, and gave anal. IV, approximating in composition to thorite or orangite.

	UO_2.	UO_3.	ThO_2.	CeO_2.	PbO.	Fe_2O_3.	CaO.	SiO_2.	H_2O.	Insol.
III.	36·42	37·94	9·32	3·20	9·48	1·86	0·63	0·73	0·82	0·21
IV.	—	13·55	48·84		3·55	1·48	1·32	22·03	9·66	—

Scheelite and wolframite as large masses from Gordonia. Zircon (var. cyrtolite) as black to grey masses from Boksput; isotropic with n 1·77, sp. gr. 3·96; analysis gave SiO_2 23·41, ZrO_2 60·82, Yt_2O_3 &c. 8·14, PbO 1·08, CaO 1·29, H_2O 4·44 = 99·18.   L. J. S.

BEBIANO (José Bacellar). *Geologia e riqueza mineira de Angola.* Lisboa (Museu Comercial), 1923, 128 pp., 1 geol. map (scale 1 : 4,000,000), 19 pls.

A general account is given of the geology of Angola (Portuguese West Africa), and a bibliography is added. Alluvial diamonds are found in the Lunda district bordering on the Belgian Congo. Other economic minerals mentioned are asphalt, coal, lignite, sulphur, graphite, mica, gypsum, gold, and ores of lead, copper, silver, tin, iron, and manganese.   L. J. S.

AUBEL (René van). *Sur quelques minéraux du Congo Belge (prehnite, dumortiérite, danburite).* Ann. Soc. Géol. Belgique, Publ. Congo Belge, 1931, vol. 53 (for 1929–30), pp. c 77–c 79.

Prehnite in metamorphic limestone from the Kasolo uranium mine, Katanga, and in amphibolite from Ubembe, Lake Tanganyika. Dumortierite in quartzose nodules associated with pegmatites near the massif of Sombwe, near Ubwari, Tanganyika; Prussian-blue, α 1·675, β 1·685, γ 1·690; pleochroism α cobalt-blue, β orange-yellow, γ almost colourless. Danburite as colourless prisms (1–3 cm.) embedded in chlorite in miarolitic cavities in the pegmatites of the massif Mulungu, southern Maniema.   L. J. S.

MANCHESTER (James G.). *The minerals of New York City and its environs.* Bull. New York Min. Club, 1931, vol. 3, no. 1, 168 + xviii pp., 70 pls.

An interesting and readable account is given of the history of mining and quarrying and of the occurrence and finds of minerals in an area within a radius of fifty miles from New York City, this including parts of the States of New York and New Jersey and a small part of Connecticut. An alphabetical list of 400 localities gives the

minerals found at each; under Franklin Furnace there is an exceptionally long list of 218 species and variety names. There are lists of species and varieties found in the whole area, and a bibliography of 848 titles. Many excellent photographic reproductions are given of mineral specimens and of several of the localities. L. J. S.

CONNOLLY (Joseph P.) & O'HARRA (Cleophas C.). *The mineral wealth of the Black Hills.* Bull. South Dakota School of Mines, 1929, no. 16, 418 pp., 64 pls., 35 text-figs. [Cf. M.A. **3**–543–4.]

A detailed account is given of the geology and mineral resources in the Black Hills, South Dakota. Gold-silver, silver-lead, and tungsten ores of both pre-Cambrian and Tertiary age are described; also iron ores, gypsum, bentonite, &c., and the many minerals found in the pegmatites around the Harney Peak granite. Pollucite has been worked as caesium ore in the Tin Mountain mine in pegmatite. It is white and fine grained, and was detected by making spectroscopic tests of many samples. Analysis by C. Bentley gave: SiO_2 47·88, Al_2O_3 17·96, Fe_2O_3 0·14, MgO 0·38, CaO 1·04, Cs_2O 23·46, K_2O 1·06, Na_2O 3·58, Li_2O 0·12, H_2O (at 110° C.) 0·37, ign. 3·45, total 99·44. L. J. S.

SCHWARTZ (G. M.). *Geology of the Etta spodumene mine, Black Hills, South Dakota.* Econ. Geol., 1925, vol. 20, pp. 646–659, 2 figs.
—— *The Tin Mountain spodumene mine, Black Hills, South Dakota.* Ibid., 1930, vol. 25, pp. 275–284, 2 figs.

Huge crystals of spodumene [M.A. **1**–305, **3**–215] occur in pegmatite. Associated minerals are beryl, lepidolite, amblygonite, &c. Mention is made of a mass of pollucite 14 inches across from the Tin Mountain mine. L. J. S.

STEWART (Duncan, *Jr.*). *Minerals at Manton, Rhode Island.* Amer. Min., 1930, vol. 15, pp. 496–498.

Additions to the list of minerals from this locality in Providence Co. [M.A. **3**–282]. L. J. S.

AUBERT DE LA RUE (E.). *Sur quelques minéraux des îles Kerguélen.* (Note préliminaire.) Bull. Soc. Franç. Min., 1929 [i.e. 1930], vol. 52 (for 1929), pp. 144–147.

Mention is made of chalcedony, opal, jasper, sanidine, stilbite, heulandite, chabazite, analcime, calcite, aragonite, and olivine from the volcanic rocks (basalts, trachytes, and pumice). Limonite is the only ore mineral. Lignite is abundant. L. J. S.

Miscellaneous.

D'ACHIARDI (G.). *Nuovi dati e ricerche sulla larderellite.* Periodico Min. Roma, 1930, vol. 1, pp. 208–213.

MILLOSEVICH (F.). *Larderellite e paternoite.* Ibid., pp. 214–215, 2 figs.

New analyses of larderellite, presumably from the borate lagoons of Tuscany, gave by S. Bonatti (mean of two): B_2O_3 71·21, $(NH_4)_2O$ 10·04, H_2O (18·75), total 100·00, agreeing with the formula $(NH_4)_2O.5B_2O_3.5H_2O$; and not with the old formula $(NH_4)_2O.4B_2O_3.4H_2O$, which was used by T. Barth and H. Berman [M.A. 4-449 in their attempt to show from the optical data an isomorphous relation between larderellite and paternoite ($MgO.4B_2O_3.4H_2O$, of F. Millosevich, 1920). X-ray powder photographs of larderellite and paternoite are quite distinct. L. J. S.

THOREAU (J.). *Sur une variété d'uranotile de Chinkolobwe (Katanga).* Ann. Soc. Géol. Belgique, 1930, vol. 53, pp. B 60–B 64, 2 figs.

A single specimen shows lemon-yellow radially fibrous aggregates on orange-yellow amorphous gummite enclosing grains of pitchblende. The fibres have straight extinction with positive elongation, α 1·632, γ 1·703 about. Analysis on 70 mg. gave: insol. (SiO_2) 6·8, UO_3 73·1, CaO ($+MgO$ trace) 7·4, Pb trace, ign. 15·4 = 102·7, corresponding with a formula $CaO.2UO_3.SiO_2.6H_2O$, i.e. with one molecule of silica less than the usual formula of uranotile (= uranophane). [Cf. M.A. 1–244, 415; 3–371.] L. J. S.

TUCAN [i.e. TUĆAN] (Fran). *Sur un acide alumosilicique d'Allchar (Serbie du Sud).* Bull. Soc. Franç. Min., 1929, vol. 52, pp. 42–47, 1 fig.

A small hill surmounting a plateau of eruptive rocks near the Gerane rivulet, east of Allchar, is made up of a white opaque material with conchoidal fracture. Under the microscope it is seen to be finely crystalline and weakly birefringent; the refractive index is greater than that of Canada balsam. Its specific gravity at 22° C. is 1·9818. L. Marie's chemical analysis gives SiO_2 41·22, Al_2O_3 23·85, Fe_2O_3 0·32. CaO 3·05, MgO 0·39, Na_2O 0·24, K_2O 0·09, H_2O (−110°) 14·41, H_2O (+110°) 14·20, P_2O_5 2·04, CO_2 0·67, total 100·48. This corresponds to the approximate formula $Al_2O_3.3SiO_2.7H_2O$. The dehydration curve was also obtained. The loss of water up to 110° C. is about 14 % and up to 500° C. 28 %; the weight of the

heated mineral then remains practically constant on raising the temperature to 900° C. From its chemical composition and its properties the author assigns it to the kaolin family, but Vernadsky suggests that it is chloritic.   F. A. B.

HEVESY (G. v.), ALEXANDER (E.), & WÜRSTLIN (K.). *Über das Häufigkeitsverhältnis Niob-Tantal in Titanmineralien.* Zeits. Anorg. Chem., 1929, vol. 181, pp. 95–100.

The niobium and tantalum content of a number of titanium minerals was investigated with a view to obtaining a figure for their probable abundance in igneous rocks. In a number of rutiles, sphenes, and perovskites, the ratio Ti : Nb was found to be about 3,000 : 1, and Ti : Ta 7,000 : 1. In ilmenites the ratios were some hundred times as great. The suggested figures for igneous rocks are 0.4×10^{-4} atoms % Nb, 0.2×10^{-4} atoms % Ta.   M. H. H.

MELMORE (Sidney). *Notes on scarbroite.* Ann. Rep. Yorkshire Phil. Soc., 1930, for 1929, Proc. pp. 9–10.

Analyses of original material (of W. V. Vernon, *afterwards* Harcourt, 1829) from Scarborough gave SiO_2 6·48, 5·69, 5·88, Al_2O_3 44·19, 44·32, 44·02, H_2O 49·33, 49·99, 50·10, totals 100·00. Birefringent scales, n 1·503. The material appears to be a mixture of colloidal aluminium hydroxide and silica.   L. J. S.

HEWETT (D. F.) & ROVE (Olaf N.). *Occurrence and relations of alabandite.* Econ. Geol., 1930, vol. 25, pp. 36–56, 8 figs.

The few known localities for alabandite (MnS) are listed, and the mineral is now recorded from Bisbee, Tombstone, Harshaw, and Chiricahua Mts. in Arizona, and from Jefferson in Montana. It occurs as a replacement of dolomite or in veins with small amounts of other sulphides. Associated minerals are often rhodonite and rhodochrosite, the latter in part as an alteration product of the alabandite.   L. J. S.

PALACHE (Charles) & MODELL (David). *Crystallography of stibnite and orpiment from Manhattan, Nevada.* Amer. Min., 1930, vol. 15, pp. 365–374, 9 figs.

Stibnite crystals from the White Caps mine show 45 forms, of which Φ. (503), Π. (673), and Δ. (425) are new [$a : b : c = 0.9926 : 1 : 1.0179$]. Orpiment shows 29 forms, of which w (250), o (101), f ($\bar{2}52$), α ($\bar{1}31$), δ (414), π (313), and μ (212) are new [$a : b : c = 0.5962 : 1 : 0.6650, \beta = 89° 19'$]. The three prominent and heavily striated

zones [001], [101], and [10$\bar{1}$] of the monoclinic crystals are not
easily distinguished.   Extinction-angle $\beta : c = -1$–$3°$ on the perfect
cleavage (010).   L. J. S.

CAROBBI (Guido).   *Ricerche spettrografiche sullo zircone vesuviano.*
    Boll. Soc. Nat. Napoli, 1930, vol. 41 (for 1929), pp. 180–184.
    Spectroscopic examination of zircon from Monte Somma, Vesuvius,
showed the presence of the elements Zr, Hf, Ti, Ce, La, Nd, Pr, Sm,
Yt, Dy, Ho, Er.   L. J. S.

MACHATSCHKI (Felix).   *Über Berzeliit.*   Zeits. Krist., 1930, vol. 74,
    pp. 230–234.   [Cf. M.A. **4**–277.]
    Berzeliite has the garnet structure and the composition (Ca_2Na)
$(Mg,Mn)_2As_3O_{12}$.   H. H.

ANTAL (József).   *A bismuth súlyszerinti meghatározása.*   [Gravimetric
    estimation of bismuth.]   Gyógysz. Dokt. Diss. Budapest, 1928,
    26 pp.
    This dissertation is mainly chemical.   New details are given for
the oxychloride method for the estimation of bismuth and its separa-
tion from lead.   Analyses are given of bismuthinite from Theresia
mine, Vaskő, S 18·49, Bi 79·54, Cu 1·07, Fe 0·03, Pb trace, SiO_2
0·75 = 99·88 ; and of tetradymite from Csiklova, Te 35·94, S 4·75,
Bi 59·12 = 99·81.   V. Z.

KOCH (Sándor).   *Einige Wismutmineralien aus dem Bánáter Kontakt-
    gebiet.*   Centr. Min., Abt. A, 1930, pp. 49–56.
    Two analyses are given of bismuthinite from Vaskő.   Cosalite as
a lead-grey fibrous aggregate, sp. gr. 6·776, from the Paulus mine at
Vaskő gave S 15·92, Bi 41·75, Pb 37·68, Ag 0·32, Cu 3·41, Fe 0·68
= 99·76, agreeing with $Pb_2Bi_2S_5$.   Rezbanyite, compact, lead-grey,
sp. gr. 6·89, from the Paulus mine, Vaskő, gave (mean of two ana-
lyses) S 17·85, Bi 59·25, Pb 18·24, Cu 4·13, Fe 0·44, SiO_2 0·06 =
99·97.   Bismutosphaerite as minute spherules from Theresia mine,
Vaskő.   Eulytine from Dognácska [M.A. **4**–380].   L. J. S.

TCHIRVINSKY (P.)   [=CHIRVINSKY (P. N.)].   *Sur la melnicovite.*
    Bull. Soc. Franç. Min., 1924, vol. 47, pp. 129–133.
    The author suggests that colloidal deposits of hydrotroilite
$FeS.nH_2O$ pass into melnikovite before their final transformation to
pyrite.   Evidence [doubtful] is adduced in favour of melnikovite
being a distinct variety of FeS_2, rather than a mixture of pyrite and
magnetite.   [M.A. **2**–78.]   F. A. B.